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Vol. VII. NEW YORK, JUNE 12, 1886. No. 24.

ABOUT this season of the year, American dogs are often disposed of in large numbers. Their taking off is said to be attended with cruelty. If American dog killers wish to improve on their methods, a suggestion is given from abroad in one of our articles this week.

DR. VIGOUROUX, of the Salpêtrière, Paris, furnishes an account, which we print to-day, of a simple method of curing sleeplessness by electricity. This treatment deserves to be widely known, for medical men say that few greater evils have to be dealt with to-day than the terrible insomnia, under which even men of iron frequently break down.

LAST week we gave a summary of the decision in the New Orleans telephone litigation. To-day we are enabled to publish the decision in full. The judges brush aside with a strong hand the claims of Reis and others, and find for Bell without hesitancy. The decision acquires peculiar significance from the fact that it is handed down before the commencement of the Government case at Columbus. Its effect on Bell stock has been favorable, causing a rise from 155 to 180 within the week.

GAS COMPANIES continue to exhibit their willingness to operate electric light systems. At Jacksonville, Fla., the gas proprietary has bought control of the American-Edison plant, and we find such corporations as the Marblehead, Mass., Dedham, Mass., and Pawtucket, R. I., gas companies, as well as many others, seeking to amend their charters, with the object of being empowered to furnish electricity as well as gas. The advantages of supplying both means of power and illumination from one establishment are many and obvious.

THE Western Union Company has at last accepted the inevitable, and has passed its dividend for the quarter ending June 30. The competition of the land telegraph companies and the cut rate warfare with the Commercial Cable Company, added to the burden of an unjust State tax on the entire capital stock, have brought its funds so low that this time it dare not even resort to the expedient tried last quarter of a scrip dividend. After all, it is better policy thus to face the ugly facts squarely. But when will the existing state of things end?

IN our columns this issue will be found an interesting review of the important patent suits regarding incandescent lamps, just decided in England in favor of Mr. Edison's representatives there. One of the main arguments related to the meaning of the word "filament." It will be seen that Judge Brett holds that a "filament" must possess the properties of flexibility and resiliency; must have a small cross-section so as to offer a high degree of resistance, and must present a small surface from which radiation of light takes place. The suit has a special importance in view of actions pending in this country at the present time.

OUR article descriptive of Mr. Edison's "phonoplex," or way-duplex, system of telegraphy has attracted universal attention not only in this country, but also in Europe where, we may add, it has been reproduced in every electrical journal and even in some papers not professedly electrical. A correspondent of the London *Electrician*, after reading the article, seems to have been set to thinking in what manner the device could be simplified, and gives his experience in a modification of the "phone." Instead of employing the split ring as a snapper he converted the diaphragm of the telephone itself into a sort of snapper sounder, similar to that used by learners of telegraphy, and which is the bane of many a schoolmaster. The correspondent of our contemporary, however, has only tried the apparatus with steady currents and not with the momentary one used in practice, so that the test of applicability is still wanting.

THE proceedings in the suit against the Western Union Company for $2,000,000 damages show how difficult it is to represent tangibly that which all know to be a very considerable actuality, worth a large sum of money. The Court has held, with the support of the highest authorities, that the property of the telegraph company injured—its poles, wires, etc.—is realty and, therefore, subject to the jurisdiction of the courts in the various States where sub-receivers were appointed. Yet back of that lies the forcible plea that by the destruction of those wires outside New York, the receiver in New York was reduced to utter helplessness in working either his local or his through service. A telegraph system is an entity so closely knit that an injury in one part is an injury to the whole. It would be easy to reduce the Western Union system to abject impotence by cutting all its feeders at the far side of the borders of New York State, and without touching its property within the State at all. Yet, if we understand the arguments of the Western Union counsel aright, this is what may be done, without redress, as in the case now on trial. It will be interesting to see how judge and jury entertain such doctrine.

IMPROVEMENTS in dynamo construction have within the past few years raised the efficiency of that form of machinery to a very high figure, and, indeed, have placed it at the head of the list in its capacity of converting energy. This is one form of efficiency in the dynamo, but we are often brought face to face with another, and that is the "efficiency per pound of material employed," or, more plainly, the weight of the machine with reference to the electrical energy which it develops. These two quantities are entirely independent of one another, and the latter only comes into consideration in the *cost* of the machine. It is evident that we may build two machines of the same capacity for developing electrical energy, but whose weights may vary considerably. In contemplating these facts, the improvements which M. Gravier claims to have made, and which are described in another column, are of considerable interest. So far as the pole pieces are concerned, the rule he lays down is applicable to both of the principal types of dynamos in use at the present time, viz.: the Gramme and the Siemens. But with reference to the increased section of armature core, it seems particularly applicable to the Gramme machine, and its non-observance in the past may account for the lower efficiency both of conversion and as regards weight of the Gramme, as compared with the Siemens machine. In the latter, the armature is generally very nearly equal in cross section to the magnets, and hence the rule is, in that case, observed. But may we not attribute the gain observed in the thickening the Gramme ring to another cause, which is also brought about by the same means? We refer to the increased distance at which the wires carrying currents in opposite directions are removed from each other by the method adopted. The mutual action between wires carrying currents is well known and with but a comparatively thin partition of iron between the wires, it is not improbable that the current in the wires on the inside of the Gramme ring, being in opposite direction to those on the outside, may have an opposing effect upon the latter, tending to reduce the total current developed. By thickening the ring, the inside wires are further removed, and hence the mutual influence is decreased. The thickening of the Gramme ring means an increase in dead or useless wire, and hence increase in internal resistance, but if by its means the machine can be made to give a largely increased output of electrical energy the method is evidently of value.

THE increase of accidents from lightning during the last generation still continues to be the study of different scientists, not to speak of those who jump at conclusions entirely beyond the possibility of proof. An interesting development of these researches, however, is to be noted in the conclusions which have been arrived at by one investigator, Dr. Andries. He regards the main cause as lying in the enormous increase in manufactories, locomotives, etc., which fill the air with smoke, steam and particles of dust of all kinds, while the increased populations contribute their share to the impurity of the atmosphere. His own experiments and those of others have shown that all the electrical phenomena of the air increase in intensity with the increase of dust in it. While the latter statement may be true, it seems doubtful whether the increase in dust caused by manufactories, locomotives, etc., can be held to be sufficiently great to account for any increased violence in electrical disturbances. When we consider the vast body of air which acts as the floating medium for the dust particles, it seems open to doubt whether the number of the particles thrown out in the manner cited can greatly increase the number per unit of volume ordinarily suspended in the atmosphere. Again, it is rarely that dust particles, so developed, are found at the altitudes in which violent electrical phenomena are developed. If we assume the cause to be as stated, the inference would be that large manufacturing cities would be especially in danger from these disturbances; but we are not aware that such is the fact. Indeed the most violent electrical disturbances are, as a rule, manifested beyond the limits of such cities. Interesting as the experiments are, and admitting their relevancy, we can hardly see our way clear to an acceptance of dust as the prime cause to which the increasing violence of electrical phenomena is attributable. We are rather disposed to the belief that changes in climatic influences, brought about by the destruction of forests, and the consequent increased evaporation, are to be held principally accountable for the effects ascertained.

THE description which we give this week of a new method of recording and reproducing speech is an advance in a field which has long been left in practical neglect. When Edison brought out his phonograph it was believed that by its agency a ready means of recording speech was at hand. That the phonograph records and reproduces speech cannot be denied, but the low quality of its performance, if we may so term it, has up to the present precluded its application in practice. Rumor has recently said that Mr. Edison had so far improved his phonograph as to make it of commercial value, but this still lacks confirmation. During the last few years, however, Professor Bell and his associates have been at work in another direction with the same object in view, and have obtained results which, while not yet of such a nature as to allow of the statement that complete practical success has been attained, give promise of speedy development. The idea of causing changes in radient energy, such as light, in conformity with the undulations in the air caused by the utterance of speech, is the fundamental principle of radiophony, in which the varying beam is caused to act directly upon a medium which correspondingly varies the current in an electrical circuit that includes a telephone. With this as a basis, the experimenters have developed a method in which they employ an intermediate process, instead of allowing the varying beam to fall directly upon an apparatus whose reproduction is only temporary. This process as described consists in the continuous photographing of the beam of light, every variation of which is thus permanenently recorded, and this photograph then serves as the medium of reproduction by interposing it in a microphone circuit. The interesting details of the method show that much thought has been bestowed upon it, and it now remains to be seen to what extent it will be practically applied. In addition to this method, however, Edison's original idea has also been taken up, so that in conjunction with the phenomena exhibited by sensitive jets, speech can be phonographed and reproduced. We reserve a description of this method, however, for a later occasion.

Sleeplessness Cured by Electrical Treatment.

In a letter to the London *Electrician* Dr. R. Vigouroux, Chief of the Therapeutic Service at the Salpêtrière, Paris, describes a very simple method of curing that terrible affliction, sleeplessness. He says:

"The efficacy of the treatment of insomnia by electricity is one of the best-established facts of electro-therapeutics. The voltaic current, the faradaic current, or even static electricity may be employed. I will confine myself to describing in detail the voltaic process, which is the readiest and the most certain. I will assume we have the ordinary medical battery, *i. e.*, one composed of Daniell or Leclanché elements, provided, among other accessories, with a collecting-switch, allowing of the gradual introduction into the circuit of the requisite number of elements without interrupting the current, and with a galvanometer graduated in fractions of an ampère. The electrodes are of the ordinary pad form, carbon or metal covered with cloth or with chamois leather. The negative electrode should be about 7 centimetres, and the positive 5 centimetres in diameter. After having soaked them in ordinary water, they are applied to the two temples, behind and above the eyebrow, with a moderate pressure. The negative pad may be intrusted to an assistant or to the patient himself; the positive is held by the operator. After waiting for a minute to allow the epidermis to become moistened, the switch is moved so as to gradually insert the elements into the circuit. At the same time the galvanometer is watched, and as soon as it indicates 15 ten-thousandths of an ampère the movement of the switch is discontinued and the current is allowed to act. Ordinarily, the deflection of the needle slowly increases; and if the rate of increase be too rapid, or, in any case, as soon as it approaches 30 ten-thousandths, the number of elements must be diminished. After the current, maintained within these limits, has passed for two minutes, it must be interrupted. This is the delicate portion of the operation; the interruption must be gradual, and the positive electrode must be removed before the other. The best means formerly, unless I am mistaken, indicated by (?) Ziemssen is to slide the positive pad, while maintaining the pressure, up to the roots of the hair, and finally to pass it on to the hair. During this manipulation the needle returns toward zero; and, at the end of it, the current has been interrupted without the production of any shock. In spite of these precautions it is difficult, in the case of certain patients, to avoid certain luminous sensations (phosphines électriques) and a certain amount of giddiness. These phenomena are absolutely without danger in the case of the current here employed. It often happens that I purposely produce them; since I have observed that when they are produced success is more certain. The only reason for avoiding them is that with very excitable or timid patients the resulting emotions may augment their nervousness and cause them to be afraid of the treatment.

"I have not mentioned the number of elements to be used, since this depends upon the (very variable) electrical resistance of the patients. The galvanometric indication is alone of importance, and is sufficient for the purpose in view.

"By means of this very simple treatment, which I have employed hundreds of times, the most stubborn cases of insomnia have, almost without exception, been overcome. Ordinarily, this is what occurs. If the galvanization has taken place in the morning, the patient experiences no particular sensation for the remainder of the day, only in some cases a little sleepiness, which increases toward night; but next day he is surprised to find that he has slept for eight or nine hours without interruption. The effect of a single sitting continues, in diminishing degree, during two or three days, after which the application must be repeated.

"For the most part a few sittings are sufficient to effect a cure. Should the first application not have a very marked effect, the process must be modified. Thus, the positive electrode may be applied to the forehead and the other to the back of the neck; or the very efficacious method of applying the positive electrode successively to the eyes may be adopted. In the last case the current must be weaker than usual (from 8 to 15 ten-thousandths), and the application shorter (one minute for each eye).

"Another simple and harmless method consists in applying to and retaining upon the temples plates of tin covered with chamois leather, serving as electrodes to one or two fluid elements of Trouvé. The application should last for two hours, or even much longer. The battery is placed in the patient's pocket, or, should he be in bed, beneath his pillow.

"If, in exceptional case, none of these methods succeeds, electricity need not on that account be given up. Some of the numerous processes of faradization, or of applying statical electricity may be, and, in fact, sometimes are, more efficacious.

"It must be understood that what is here referred to is insomnia properly so called, and not the sleeplessness occasioned by pain in any portion of the body. I repeat that, by means of the processes which I have just described, I have restored sleep to patients who declared that they had not slept for months or years, and who took, without effect, enormous doses of morphia or chloral.

"I called the attention of medical men to these facts in a note published ten years ago in the *Journal des Connaissances Médicales*. But I am far from wishing that I should be thought the inventor of the process. It was, and it still is, more or less indicated in works on electro-therapeutics. Nevertheless it seems to me that it is not at the present time sufficiently known and practiced."

Some Important Considerations in Dynamo Construction.

In an extended study of the distribution of magnetism in the pole-pieces and armatures of dynamos, M. Alphonse Isidore Gravier, of Paris, has reached certain conclusions

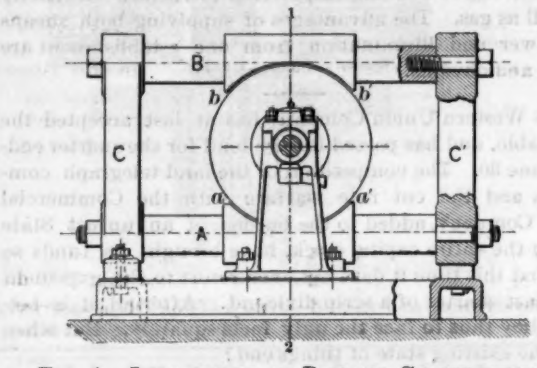


FIG. 1.—IMROVEMENT IN DYNAMO CONSTRUCTION.

which appear to be worthy of consideration, as they are based upon sound argument substantiated by experiment.

The improvements effected by M. Gravier are founded essentially upon (1) the arrangement and distribution of the pole-pieces and their relative distance from each other; and (2) upon the application, in the armature, of masses of iron in definite relation and arrangement to the former.

Without entering into the details of M. Gravier's experiments, we may state briefly that they show that in many dynamos, as constructed at present, the pole-pieces are of such shape and extent, that they distort the field, and do

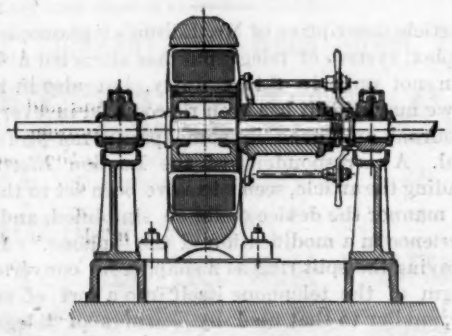


FIG. 2.

not permit it to exert its proper effect. Again, he shows that in many cases by making the pole-pieces encircle the armature to too great an extent, the lines of force pass directly from pole to pole without exerting any action at all upon the armature.

The conclusion which he arrives at in this matter is that for the best effect the distance between the ends of the two pole-pieces should be equal to the width of the pole-pieces; or, as shown in Fig. 1, that the distance *a b* equal the distance *b b'*. Experiments have demonstrated that solely by this method of contracting the pole-pieces, a machine,

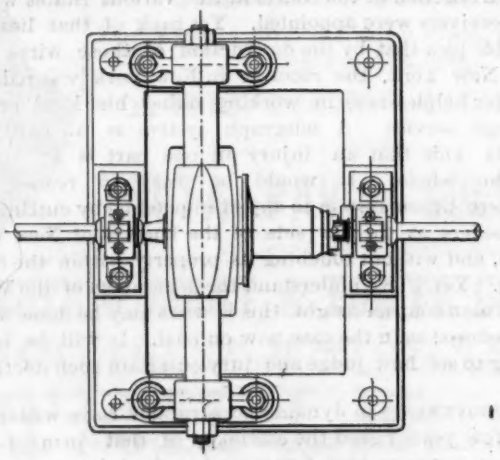


FIG. 3.

unaltered in every other respect and driven at the same speed, showed an increase of 25 per cent. in the electromotive force developed.

In taking up the study of the armature, M. Gravier started out by doubling the thickness of the iron core of a Gramme machine, by which sole means he doubled the electromotive force of the machine. Trebling the thickness of the core trebled the electromotive force, but further thickening had no corresponding effect.

Reasoning from cause to effect, M. Gravier concludes that every dynamo consisting of a fixed and a movable part constitutes a complete magnetic circuit; and hence, in order to obtain the maximum effect from the quantity of material used, the magnetic circuit ought to be completely closed through both parts—*i. e.*, the armature ought to work in contact with the pole-pieces. This evidently is not practicable, but the same end can be reached by increasing the cross-section of the armature, in breadth and thickness, M. Gravier doubles, trebles, quadruples, etc., the cross-section of his armature core in comparison with that of the pole-piece, and the limit of increase is reached when no trace of external magnetism can be detected. The minimum cross-section of the armature core, therefore, ought to be equal to that of the pole-pieces, and the maximum cross-section depends upon the distance between the iron of the core and that of the pole-pieces.

By combining these two rules in relation to the form of pole-pieces and the cross-section of the armature, M. Gravier claims to have obtained four and five times the E. M. F. with machines identical in every other respect. One of the machines so constructed is illustrated in our engravings Figs. 1, 2 and 3. The magnet cores *A*, *B*, are 100 mm. in diameter, and hence 7,854 sq. m. in section. At the pole-pieces the magnet cores are thickened to 180 mm. and are then hollowed out up to the centre line of the cores, as shown in Fig. 1. As indicated above, the distance *a b* between the pole-pieces is equal to their breadth *b b'*.

The armature core consists of sheet iron discs cemented together, and its cross-section is equal to 18,564 sq. mm., so that the ratio between the cross-section of armature and magnet is equal to $\frac{18,564}{7,854} = 2.53$.

The machine complete weighs about 800 kilograms (about 1,760 lbs.), and at a speed of 600 revolutions generates a current of 530 ampères at an E. M. F. of 129.6 volts. This would give about 92 electrical horse-power delivered by the machine weighing 1,760 pounds, so that one electrical horse-power is developed for every 19 pounds of material employed. This is a remarkably low figure, and emphasizes the value of the improvements suggested.

Killing Dogs by Electricity.

The Kimberley, South Africa, Borough Council, on the recommendation of its electrician, Mr. R. L. Cousens, recently resolved that in future all dogs that were captured without license ticket, and no owner appearing to claim them, should be dispatched by means of electricity, as the method of poisoning, used previously, was by no means effective, the brutes frequently lingering from half an hour to two hours before death ended their misery. The dogs are put into boxes, which can be opened at each end, at the bottom of which are fixed, on insulators, two copper plates, separated from one another by about three inches, so that the fore feet of the dog may rest on one plate and the hind feet on the other. To the copper plates are fastened two wires which lead to two switches hanging on the wall. One of the Brush machines, which lights twenty-three of the lamps during the evening, is connected with the switches. The copper plates in the box are moistened with salt and water, in order to secure better contact between the paws of the dog and the plates; the dog is put into the box, the ends being closed, then when the fore paws are on the one plate and the hinder ones on the other, the switches are closed, and the machine is short circuited. The moment the short circuit is taken off the current goes through the body of the animal, and it is instantaneously killed. The only time taken up is in the act of putting the dogs into the boxes and taking them out again. On one occasion 23 dogs were killed in less than the same number of minutes.

The Government's Telephone Lawsuit.

With regard to the action in the government suit against the Bell patents, a special dispatch from Columbus, O., of June 1, says: Harrison Olds and Marsh, of this city, attorneys for the Bell Telephone Company, have filed with the Clerk of the United States Court here a recital of facts denying the jurisdiction of said court in the case of the United States against the American Bell Telephone Company.

They claim the Bell Telephone Company is a corporation established under the laws of Massachusetts, and has always had its place of business and maintained its office in said State. It never was, and is not now, an inhabitant or resident of, nor is it to be found in, Ohio. It has never carried on the business of telephony, nor has it ever had an officer, managing agent, or partner in this State. After reciting the facts relating to the application of Bell for patents, the attorney said: "At the time when each of said patents was applied for and granted, the legal official residence of all the officers of the Patent-Office was in Washington, and Bell was an inhabitant of and resident of Massachusetts, and not of Ohio. Thereafter by purchase the entire and absolute title to said patents became vested in the American Bell Telephone Company, and all said assignments were executed and delivered in Washington or Massachusetts, and not in Ohio."

Hence the jurisdiction of the United States District Court for the Southern District of Ohio is denied.

A later dispatch, dated June 5, from the same place, says: The attorneys in the telephone case have had several consultations, but up to the present time have not come to an agreement. On Monday morning another conference will be held, and the court will undoubtedly be asked to fix a day for the preliminary hearing. It is now thought that the case will be set for an early day, as ex-Senator McDonald and other counsel will be here on Monday. The first question to be settled will be that of jurisdiction, and should it be decided that this court has jurisdiction, there will be but little delay in beginning the case.

A Large Wimshurst Influence Machine.

The static influence machine devised by Mr. Wimshurst is rapidly gaining in favor in England over other forms for use as static generators, and this is mainly due to its three characteristics, viz.: (1) its remarkable independence of atmospheric conditions; (2) its power of self-excitement; and (3) its constancy of polarity.

The construction of this excellent machine was fully described in our issue of Feb. 15, 1885, and we need not, therefore, enter into it anew. The machine represented in the accompanying illustration, for which we are indebted to *Engineering*, is the latest one constructed by Mr. Wimshurst, in his amateur workshop at Clapham. It consists of eight of the well-known plates—which may henceforth be aptly called by the distinctive appellation of Wimshurst plates—each being 2½ ft. in diameter and carrying sixteen sectors. When the plates are rapidly rotated in opposite directions, a high degree of electrification is produced. In order to diminish as much as possible the loss of charge arising from the usual causes, all the conductors, and even the rods carrying the metallic brushes, are covered with a thick coating of gutta-percha, and the whole apparatus is inclosed within a tightly-fitting and dust-excluding glass case. In like manner, the brass rods which lead from the prime conductors to the outside terminals are carried up through glass tubes. By these means, the losses due to leakage and discharge to neighboring bodies are greatly reduced, and the efficiency of the machine correspondingly increased.

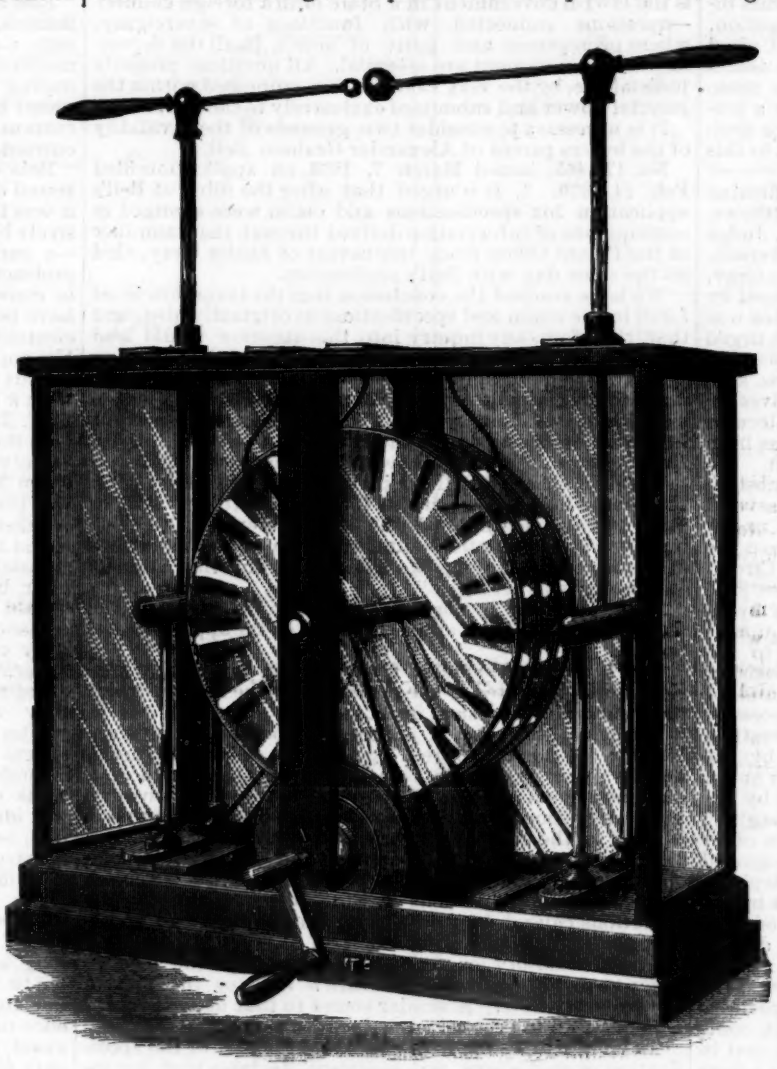
Some idea of the electrical power developed by this machine may be formed from the easily reproducible fact that every turn of the handle gives six sparks, each of 8 in. in length. One complete revolution, therefore, generates a quantity of electricity corresponding to a disruptive discharge of 4 ft. length. Sparks of 10 in. and 12 in. are readily obtained. Some of the former have been photographed, and are remarkably beautiful, showing in a marked manner the multiple and branching character, as well as the zigzag path of the discharge between terminal and terminal.

The condensers used were made of ordinary hock bottles, and the discharge was accompanied by an almost unbearable snapping noise, comparable in loudness to a pistol shot.

This machine was specially constructed for the course of afternoon lectures now being given by Professor George Forbes at the Society of Arts. In one of these, in order to show the strain produced in a dielectric medium when acted upon by an electromotive force, the professor endeavored to repeat a famous experiment of Dr. Kerr's: two wires leading from the terminals of the machine, dipped into mercury contained in two small glass bulbs. These were immersed at a little distance from each other in a cell containing carbon disulphide. A beam of polarized light was then passed through the liquid, and the analyzer turned until the light was cut off. It was duly explained that the stress to which the liquid dielectric (CS_2) would be subjected on turning the machine would be made manifest by the reappearance of the light on the screen. The stress, however, proved to be so great as to noisily shatter the glass bulbs before any optical effect could be perceived. The point was thus demonstrated in an unmistakable and probably unwished-for manner. The same principle of strain was again illustrated in the case of Leyden jars by separating the terminals of the machine as far as possible and rapidly rotating the plates. Though the walls of the jars were unusually thick, they were unable to resist the intense electrostatic strain produced by the high electromotive force of the machine. This electromotive force has been measured in terms of that of a Daniell's cell, and found to be 50,000 volts, while the current has been estimated at the $\frac{1}{1000}$ of an ampère.

In this connection it may be interesting to state that a series of measurements has been made for the purpose of comparing the quantity of electricity developed respectively by a Voss and a Wimshurst machine provided with plates of equal diameter, the result showing that the latter yields three and a half times as much as the former.

The machine which is pictured above was exhibited at the recent Royal Society conversazione. It attracted considerable attention, as did also the photographs of the spark discharge.



LARGE WIMSHURST MACHINE.

Glow Lamp Patents.*

Two questions relating to patent rights in electric lamps have been fought out during the last fortnight, and have been decided in favor of the plaintiffs. In the first of these the Edison and Swan Electric Light Company sued Messrs. Woodhouse & Rawson for the infringement of three patents, namely, one of Edison's describing a glow lamp with a carbon filament, one of Swan's describing the method of getting rid of the occluded gases by heating the carbon and at the same time working the pumps, and a third of Gimingham's showing a simple method of attaching the carbon to the conducting wires. At an early stage of the proceedings the judge, Mr. Justice Brett, decided that there was no evidence of infringement of the latter two patents, and consequently they dropped out of the case. Edison's patent is dated November, 1879, and has four claims, the latter two of which are not alleged to have been infringed by the defendants. The first claim is for "an electric lamp for giving light by incandescence, consisting of a filament of carbon of high resistance, made as described, and secured to metallic wires as set forth." The second claim is for "the combination of a carbon filament within a receiver made entirely of glass, through which the leading wires pass, and from which the air is exhausted for the purposes set forth." In this latter claim it is important to notice that it is not a carbon filament "made as described," which forms part of a combination, but apparently any make of filament. The filament referred to in the first claim was made by carbonizing some thin material, such as thread, in the form in which it is intended to be used. Now, although Messrs. Woodhouse & Rawson's method of manufacture did not transpire in court, it is generally understood that they do not follow the process here described. The chief interest, therefore, centred in the second claim, which, the plaintiffs contend, gives them the sole right to manufacture glow lamps in which a filament of carbon, of whatever make, is contained in an exhausted glass globe through which the conducting wires pass. The first point to be decided was the meaning of the word "filament." Sir Richard Webster, in opening the plaintiff's case, illustrated its signification by explaining that the difference between Edison's conductor and those of previous inventors was that he carbonized a thread instead of paring down a carbon stick to the smallest possible size. Mr. Aston submitted that the qualities essential to a filament were flexibility and elasticity, as well as fineness, and that even if the word implied fineness only, this was sufficient to differentiate between Edison's lamp and its predecessors. In giving his judgment Mr. Justice Brett laid down that a filament must possess the properties of flexibility and resiliency, and must have a small cross section offering a high degree of resistance, and must present a small surface from which radiation of light takes place. Taking that definition, it was clear to him that the defendants infringed Edison's second claim. His lordship then went through the pleas which had been put in to invalidate the patent. It had been argued that the claim was too comprehensive, that the specification was not sufficiently detailed for a workman to follow, that the lamp was not a good one, and that at the date of the final specification Edison himself knew of a better method of making the filament, for a more efficient process was described in a provisional specification of his bearing an earlier date than the final specification. The first three objections the judge treated lightly, as of little moment, but the last he considered as of more weight, but he finally overruled it as the patent did not claim any particular method of making the filament, and indeed could not legally claim the better method, as it was not foreshadowed in the provisional specification. As to alleged anticipations of Edison's patent which had been brought forward, his lordship found that those of Lane-Fox, Pulvermacher and Sidot did not contain the elements of Edison's combination, while Swan's early lamp, which had been exhibited but not patented, had a carbon rod or pencil, which, in his opinion, was not a filament. The judgment was therefore for the plaintiffs on the first patent, and for the defendant on the other two. The second case related to the infringement of a patent granted to Messrs. Sawyer and Man in 1878, and which is now the property of the Edison-Swan Company. The specification, as amended by disclaimer, contains three claims as follow: "The herein described process of preparing the illuminating part of an electric lamp, consisting of electrically heating the same while it is surrounded by a carbon gaseous liquid; secondly, a material for the manufacture of the illuminating conductors of electric lamps, produced by electrically heating carbon in a carbon gas; thirdly, the hereinbefore described method of preparing the illuminating part of an electric lamp, consisting in first obtaining a solid deposit of carbon by electric action as set forth, and subsequently, when the globe containing it is charged with a carbon preservative atmosphere, and before the lamp is finally sealed, heating the illuminating part by means of the electric current, in order to expel impurities and occluded gases." It was practically admitted by the defendants, Messrs. Woodhouse & Rawson, that they infringed the patent, but they contended that it was invalid.

In proof of this they adduced certain accounts of experiments made by Mr. Justice Grove in 1845, by Despretz in 1849 and by Sidot in 1870. The first of these the judge ruled had practically no bearing on the case. The second, those of Despretz, were made to show that carbon could be fused or melted and also evaporated, and for this purpose he transmitted a powerful electric current through conductors, and obtained on them a coating of carbon. This, his lordship said, was a material very like that used for electric lighting by incandescence, but he thought that the defendants had failed to show that Despretz's process would obtain one very important result, namely, the proper filling up of the pores of the carbon material. This was brought about in the patentee's process by gradually increasing the electric current, and consequently the heat, while Despretz used the whole electric force at once and continuously. Sidot operated by means of heat derived from some source other than electricity, and thus produced a solid carbon from a gaseous material. He suggested that the carbon might be used for electric lighting, probably meaning arc lighting. The judge, however, held that the process was different from Sawyer and Man's, and that it was not a practicable one for producing filaments for glow lamps because the thin parts of the carbon were not more heated than the thick parts, and hence there was no tendency to produce an even solid structure. He therefore pronounced the patent valid, and found for the plaintiffs.

* London *Engineering*, May 28.

Proposed Sale of Postal Telegraph Property.

The time appointed by the Common Pleas Court, Cleveland, O., for the sale there of the entire property of the Postal Telegraph and Cable Company, was June 4 at 2 P. M. The property was to have been sold by public auction by the receiver and special commissioner, Messrs. A. B. Chandler and Henry Rosener of New York. The property to be sold consists of all the appurtenances of the company in Ohio and is appraised at $63,000.

The action at law grew out of two liens upon the property of the Postal Telegraph and Cable Company, one held by Messrs. C. C. Brown and Thomas Fleming, and the other by the Farmers' Loan & Trust Company of New York City. Both liens were promissory notes bound by mortgages. Action was brought by the trust company in June, 1885, to foreclose the mortgage, and a receiver was appointed in December of the same year. The Ohio parties brought similar action against the telegraph company, and the same receiver was appointed. The claims of Brown and Fleming against the telegraph company were $43,000, and action was brought both before the Cuyahoga Common Pleas Court and the Supreme Court of New York; January 16, in accordance with an order of the court in the latter State, a sale of the entire property was made by auction in New York City to Mr. Edward C. Platt for $40,000, subject to liens in other States. Brown and Fleming, the plaintiffs in the case pending in the Ohio court, assigned their judgment to Mr. Platt, and since then an effort at compromise has been made by all the parties concerned. A motion was made on June 3 in the Cleveland court to have the sales in New York confirmed, in which case the necessity of a new sale will be obviated. The case was argued before Judge Lamson and submitted. The sale was postponed. But in case the court confirms the receiver's sale in New York no sale will take place at Cleveland.

Salem to Lynn Underground.—A project is afoot to connect Salem and Lynn by an underground system of telegraph and telephone wires.

The New Orleans Telephone Decision.

Subjoined is the full text of the decision given on May 31 at New Orleans, in the case of the American Bell Telephone Company *et al.* against the National Improved Telephone Company *et al.*, Judges Pardee and Billings sitting *en banc*.

In this case J. J. Storrow, T. J. Semmes, Bayne & Denegre and E. N. Dickerson represented complainants and J. R. Beckwith, Farrar & Krutschnitt and A. G. Brice appeared for defendants.

Circuit Court of the United States, Eastern District of Louisiana—American Bell Telephone Company *et al. vs.* National Improved Telephone Company *et al.*—Before Don. A. Pardee, Circuit Judge, and Edward C. Billings, District Judge.—This cause is before us on an application for a preliminary injunction by Bell, answers, numerous affidavits, depositions and exhibits. We heard the application discussed by the solicitors on both sides, with many adjuncts of experiment and illustration, for the period of twenty-one days, and we have striven to give to the question the study and consideration to which it is entitled, from the fact that so many of our fellow-citizens throughout the entire country are interested in its decision.

A very long discussion, in which solicitors of ability and learning participated—such as has been the one conducted before us—has one great advantage; it tends to separate by a clear line of demarcation that which is sound in law and sustained in fact from that which, however plausible and forcibly urged, analysis and proof compel the abandonment of.

The complainants have urged that since the patents involved here have been the subject of judicial investigation, ending in decisions in the Circuit Courts of the United States maintaining their validity, that so far as the issues presented in those causes have been identical with those involved in this cause, for the purposes of granting a preliminary injunction to run *pendente lite*, those prior decisions elsewhere obtained are sufficient. We assent to this doctrine.

The proofs submitted to us include decrees affirming these patents by Mr. Justice Gray, Mr. Justice Matthews, Judge Lowell, Judge Blatchford, Judge Wallace, Judge Nixon, Judge McKinnon, Judge Butler, Judge Nickerson, with opinions at more or less length by Mr. Justice Gray, Judge Lowell and Judge Wallace. It has been urged by the respondents that in all these causes save one there was either an absence of one or more of the defenses here urged or collusion between the parties and consequent imposition upon the courts, so that the decrees and decisions submitted and referred to above should not of themselves be the basis of the decision and decree here. In the Molecular case, decided by Judge Wallace last June, there has been no charge of collusion and consequent imposition. We think that these causes abundantly show that the substantial defenses here submitted have been urged in several of those cases (though perhaps they have not been urged with the vigor and persistence that have characterized the defense here), and that the settled practice in the Circuit Courts of the United States would authorize the granting of the injunction *pendente lite* upon the authority of the decrees in those cases. We do not understand that the weight given by one Circuit Court to the adjudications of another rests entirely upon the basis of comity, but as well upon that of recognized rights and of convenience, and that it is largely to prevent the necessity of more than one court going through with the investigation of the same facts that the inference desired by the first court is for the purpose of determining whether or not an injunction shall go till the final decree adopted by the other Circuit Courts. In addition to the weight to be given to the adjudications in favor of the Bell Company in other circuits on the basis of convenience, comity and recognized rights, it is urged that the National Improved Telephone Company, the principal defendant here, is estopped by the final decree rendered by Judge McKinnon in the Pittsburgh case because it was privy to that suit, and had a day in court there.

The evidence shows that the National Improved Telephone Company claiming to own certain patents pertaining to telephony was the licensor of the Pittsburgh company, and contracted for a consideration received that in case of any litigation involving the validity of said letters patent or any of them wherein the Pittsburgh company should be a defendant, the said National Improved Telephone Company should have prompt notice thereof and should assume control of said litigation and at its option be made a party thereto at its own expense; that the Pittsburgh suit did involve the validity of said letters patent; that the National Improved Telephone Company was promptly notified thereof and did assume control of the litigation, preparing an elaborate defense and appearing therein by counsel, who were heard by the court, and that becoming dissatisfied by the refusal of the court to go behind the decrees of other circuits in the matter of a preliminary injunction, the National Improved Telephone Company "ordered the immediate withdrawal from the court of all the evidence, instruments and documents of every character connected with the defense," and immediately dismissed the counsel in said case.

In Robbins vs. Chicago, 4 Black, 657, it is said:

"Conclusive effect of judgments respecting the same cause of action and between the same parties, rests upon the just and expedient axiom that it is for the interest of the community that a limit should be opposed to the continuance of litigation, and that the same cause of action should not be brought twice to a final determination.

"Parties in that connection include all who are directly interested in the subject matter, and who had a right to make a defense, control the proceedings, examine and cross-examine witnesses, and appeal from the judgment.

"Persons not having those rights substantially are regarded as strangers to the cause; but all who are directly interested in the suit and have knowledge of its pendency, and who refuse or neglect to appear and avail themselves of those rights, are equally concluded by the proceedings."

See also Chicago vs. Robbins, 2 Black, 418.

To the same effect are Cromwell vs. County of Sac, 942, S. 351; Chamberlain *vs.* Preble, 11 Allan, 370; Tredway *vs.* Sioux City, 39 Iowa, 663.

The rule is applied in patent cases. Robertson *vs.* Hill, 6 Fisk, 465; Miller *vs.* Liggett, 7 Fed. Rep. 19.

No authorities are cited to the contrary, but counsel have argued that the National Improved Telephone Company had a right to withdraw from the litigation, and that thereupon, in some unaccountable way, the company was released from all responsibility, and that the complainant had no right to proceed to a decree.

We cannot avoid the conclusion that so far as the National Improved Telephone Company is concerned in this suit that it is bound and concluded by the final decree rendered at Pittsburgh, and that that decree alone warrants the injunction *pendente lite* in this case as against said telephone company and its privies.

Since we have had the cause so exhaustively presented and we have so fully considered it, we have determined not to rest our conclusions upon the decrees in the other circuits, sufficient as we deem those to be, but to examine the questions *de novo*.

It is urged by the defense that there should be given a weight to the fact that the executive department of the government has directed the institution of a suit to annul this patent that should lead us to refuse or defer any affirmation of the patentee's rights till the conclusion of that suit. To this we cannot assent. The executive department has not in this case attempted to adjudicate rights, nor could it in any case do more than start the judicial inquiry and present the cause to the courts. The filing of an information cannot create a presumption of guilt. No more can the institution of a suit to annul create a presumption of nullity. If any effect is to be given to the pendency of this suit to annul so as to suspend any rights of the patentee, it could only result from restraining or other orders issued in that suit, where the court having the parties and the evidence upon which the nullity is sought to be established before it has also the authority, if to annul them, to suspend the force of the patent.

There is a class of cases where the decisions of the executive is conclusive upon the courts. This class includes only those which present political questions, such as which is the lawful government in a State or in a foreign country—questions connected with functions of sovereignty, where promptness and unity of action in all the departments of government are essential. All questions properly judicial are, by the very Constitution, embraced within the judicial power and submitted exclusively to the courts.

It is necessary to consider two grounds of the invalidity of the letters patent of Alexander Graham Bell.

No. 174,465, issued March 7, 1876, on application filed Feb. 14, 1876. 1. It is urged that after the filing of Bell's application his specifications and claim were changed in consequence of information derived through the examiner of the Patent Office from the caveat of Elisha Gray, filed on the same day with Bell's application.

We have reached the conclusion that the invention is set forth in the claim and specifications as originally filed, and that, therefore, any inquiry into this question would lead to nothing which could affect the validity of the patent.

It is overwhelmingly established that Bell made the affidavit to his claim and specifications as originally filed on the 20th day of January, and that Gray's description of his invention embodied in his caveat was not written out till three or four days prior to Feb. 14, when it was filed.

The fifth claim of Bell originally filed is as follows: "5. The method of, and apparatus for, transmitting vocal or other sounds telegraphically as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

In the specifications originally filed by Bell there is the figure and description and illustration of the apparatus and process.

Fig. 7. Another mode is shown in Fig. 7, whereby motion can be imparted to the armature by the human voice or by means of a musical instrument.

The armature *c*, Fig. 7, is fastened loosely by one extremity to the uncovered leg *d* of the electro-magnet *b*, and its other extremity is attached to the centre of a stretched membrane *a*. A cone *A* is used to converge sound-vibrations upon the membrane. When a sound is uttered on the cone the membrane *a* is set in vibration, the armature *c* is forced to partake of the motion, and thus electrical undulations are created upon the circuit *E b e f g*. These undulations are similar in form to the air vibrations caused by the sound—that is, they are represented graphically by similar curves.

The undulatory current passing through the electro-magnet *f* influences its armature *h* to copy the motion of the armature *c*. A similar sound to that uttered into *A* is then heard to proceed from *L*.

To simplify: In the fifth claim and the part of the specification quoted above, the applicant declares that his invention consists in this: In the discovery that vocal or other sounds, by being uttered or otherwise communicated through a receiver, and by reason of their force being made to impinge upon an armature, impart to it the vibrations of the air; that these motions of the armature cause corresponding undulations in the electrical current, so that at the end of the circuit similar vibrations are given to another armature, through it to the surrounding air and through the air to the human ear. Thus voice is communicated to the electrical current, and reproduced at the end of the wire in the air, and all this by reason of the discovered fact that vibrations in the air caused by sound are so similar to the undulations in the electrical current that vocal sound, of whatever character itself, may be passed from air to the electrical current, and delivered again through the air by means of a receiving and a delivering or emitting armature.

The great discovered fact was that the vibrations in the air are similar in form to the following and imparted electrical undulations, and that the undulations are similar to the ultimate vibrations.

It follows that as are the vibrations so are the undulations, whether gradual or sudden, of whatever pitch or loudness, whether constant or varying in pitch or loudness, whether caused by a single or by successive sounds. We think this a sufficient description of the process and apparatus, and of the whole discovery patented, and that it neither required nor did it require (*sic*) any substantial changes by the amendments subsequently made, no matter from what source suggested or desired.

Another objection urged by the defense was that the apparatus described in the specifications and illustrated by Fig. 7 is not capable of transmitting articulate speech. There are affidavits to this effect, but the affidavits in favor of the capability are very strong and satisfactory and the court itself through its own senses was convinced that the transmission of speech had been completely attained by means of the Bell apparatus, as exhibited by Fig. No. 7.

The fact that Bell's invention certainly dates from Jan. 20, 1876, and that it covers a speaking telephone transmitting articulate speech, by means of an undulatory, oscillatory or vibratory current of electricity, renders it unnecessary to pass upon the evidence relating to the tergiversations and claims of Gray, the alleged frauds of Bell in advancing his application for a patent, the illegal conduct and conflicting statements of Examiner Wilber, and many alleged vices and irregularities, the evidence of which forms the bulk of the record, and apparently the main defense in the case.

At the same time it is proper to say that in all the evidence we have found nothing that shows that Bell has done or caused to be done anything inconsistent with his right to be called an honest man, with clean hands.

If he availed himself of information derived from Wilber as to the contents of Gray's caveat, filed on the same day as his (Bell's) application [which, however, does not appear], he had a right to do so to enable him to restrict and limit and clearly define his application, as the information shown to have been furnished was furnished under the authority of Rule 33 of the Patent Office for such purpose.

We will next consider the second ground of defense, which is that the invention of Bell lacked novelty, because it had been anticipated by Philip Reis.

That Reis made great strides toward the discovery of the great fact or law subsequently announced in the fifth claim of Bell does not admit of doubt.

That he failed to reach it is equally beyond question.

"It is impossible to transmit speech electrically by means of that operation, for the reproduction of articulation requires the reproduction not merely of the number of sonorous vibrations, but what is technically known as their form or character. The electrical changes on the line which are to convey this characteristic from the transmitter to the receiver cannot do that unless they take note of that characteristic and bear its impress. This is as certain as any elementary proposition of geometry."

Reis apparently had no idea of operating through a continuous, uninterrupted current, which should be undulatory, *i. e.*, should be plastic, impressible and should be the medium of receiving freely and continuously and reproducing exactly the vibrations in the air accompanying sound by the corresponding disturbances in the electrical current without any intermission of the flowing of the current.

Reis discovered that by means of the electrical current sound could be received, transmitted and delivered. But it was the pitch of tones that was transmitted, and exclusively by means of an intermittent make and break current—a current incapable of conveying the form of sounds, protracted or varying sounds, and, therefore, incapacitated to convey articulate speech. His apparatus appears to have been devised in the attempt to transmit speech by electricity, but the attempt was an acknowledged failure. His apparatus, under the influence of the voice or other sounds simply broke the circuit at each principal vibration with a frequency corresponding to the pitch of the sounds. Prof. Trowbridge says:

In the Jahresbericht, or the annual report of the Physical Society of Frankfort for the year 1860-61, is an account given by Reis himself of his invention and apparatus. It was presented to the court as translated in the biographical sketch of Philip Reis, by Silvanus P. Thompson, published in London in 1883. Upon a suggestion that the translation might be imperfect, we ordered that the memoir be obtained from the Congressional Library, and should be translated into English by J. Hanno Deiler, Professor of German in the Tulane University. We have carefully compared Mr. Reis' description of his invention and apparatus as given in the two translations. While differing in the words used in the two renderings, they agree in making Reiss state that he uses an "intermittent current," and that "each sound wave effects an opening and closing of the current." This is made even more palpable by his illustration of his apparatus or instrument. This is entirely inconsistent with any idea of a continuing current which should undulate, *i. e.*, be increased or diminished merely by an apparatus so constructed as to be susceptible of being set in motion by the vibrations of the air produced by sound, and should freely receive, convey and deliver single or successive sounds by reason of being so constructed as to be capable of being started and continued in motion just as long as the vibrations of the air lasted. He did not apply to his instrument the law—indeed, he seems not to have designed his instrument with any reference to the law—that the vibrations in one medium had an exact correspondence to the undulations in the other, not only for an instant, but for any period of time.

The merit, and, as we think, the originality of the Bell invention consisted in the discovery of this law and in the construction of his apparatus so that when the sound caused aërial movements or vibrations they might without any intermission of the current be freely transferred or translated into electrical undulations which again at the end of the circuit would freely reproduce the aërial vibrations and thus convey, single or combined, transmitted sounds to the ear and continue to convey them without interruptions as originally uttered, whether single, combined or successive.

A great fact in proof of the correctness of this deduction is, that the instruments invented by Reis and his methods were described in many scientific papers and works, and were well known in the scientific world, and the instruments were manufactured and on sale in Paris, Vienna and Frankfort, and had been exhibited before the British Association, and a pair were deposited in the Smithsonian Institution, and yet before 1876 there was no speaking telephone in use nor any pretense of any.

The various reproductions of Reis and his methods all were based upon the same defective electrical means—an intermittent circuit-breaking current, and all were practical failures for the transmission of speech until Bell's method was discovered.

From the evidence submitted in this case it seems clear that now, in the present state of the art, neither that Reis' instruments nor any reproduction of them can be made to transmit articulate speech except by changes of some form in the instruments themselves or by the employment of Bell's method.

We, therefore, conclude that neither Reis nor his successors anticipated the invention of Bell as set forth in the fifth claim of his application and patent, and as illustrated by Fig. 7, described in his accompanying specification.

The Meucci defense that is brought forward in defendants' record, taking up 120 printed pages, was abandoned by counsel on the hearing and no effort made to sustain it.

There remains, therefore, but the question of infringement.

This matter has not been squarely met by the defendants.

The complainants' bill alleges, and their experts testify in the opening papers, that the instruments used by the defendants consist of a microphone transmitter and a magneto receiver, which has been decided in the Spencer and Molecular cases to be an infringement.

The defendants in their answer (unsworn to) in a vague and argumentative way deny infringement.

In their affidavits they do not attempt to show what they were using at the filing of the bill; but they allege, in affidavits filed pending this motion, that "Defendants' apparatus, as now used, may be more particularly defined as operating in method or principle of operation under the Reis inventions of 1860–64, and under special inventions patented by Randall May 21, 1878, May 4, 1880, May 3, 1881," complainants having filed affidavits showing infringement in this apparatus now used. Leave was granted to defendants to file another affidavit stating fully what it is that defendants use. Under this leave an affidavit of C. A. Randall (the sixth in the record) has been filed, which contains much impertinent matter reflecting on counsel and opposing experts, but throws no direct light upon the matter, but from the affiant's argument we infer that he means to say that defendants are using the apparatus above referred to. The complainants urge, and their affidavits show, that the instruments of the Randall patents above referred to transmit speech by means of the Bell variations of current, and we are disposed to agree with them in this view.

Let the injunction issue.

DON A. PARDEE, Circuit Judge.
EDWARD C. BILLINGS, District Judge.

A dispatch from New Orleans, June 7, says: In the case of the Bell Telephone Company against the National Improved Company, wherein, on the 1st inst., Judges Pardee and Billings issued an injunction *pendente lite*, the defendants asked that they be allowed to bond the injunction until the case is ultimately decided. The argument on the question of bonding the injunction was heard this morning by Judges Pardee and Billings. After consulting with Judge Billings, Judge Pardee said that they would take under advisement the application, and meanwhile would allow the Crescent City Telephone Company to continue its business and fulfill such contracts as were in existence, provided that no contracts which had expired since the injunction, or should expire from day to day, should be renewed, but whenever the contract expired the vestment was to be taken out. He and Judge Billings would consult further, but it was as well to say that they had better go on and take steps preparatory to winding up, as he did not think there would be any change from their present impression that the application to bond the injunction should be denied.

A New Method of Transmitting, Recording and Reproducing Speech.

When the Bell telephone made its appearance, and its great sensitiveness was recognized, several methods were rapidly suggested by which changes in currents were produced by means of variations in radiant energy influenced at a distance. This gave rise to the science of radiophony and several forms of radiophones, among them being that of Prof. Bell, in which the selenium cell, or lamp-black, is employed. It was in following out these investigations that the idea suggested itself to seek a method by which speech could not only be transmitted by radiant energy but also permanently recorded, so as to permit of reproduction.

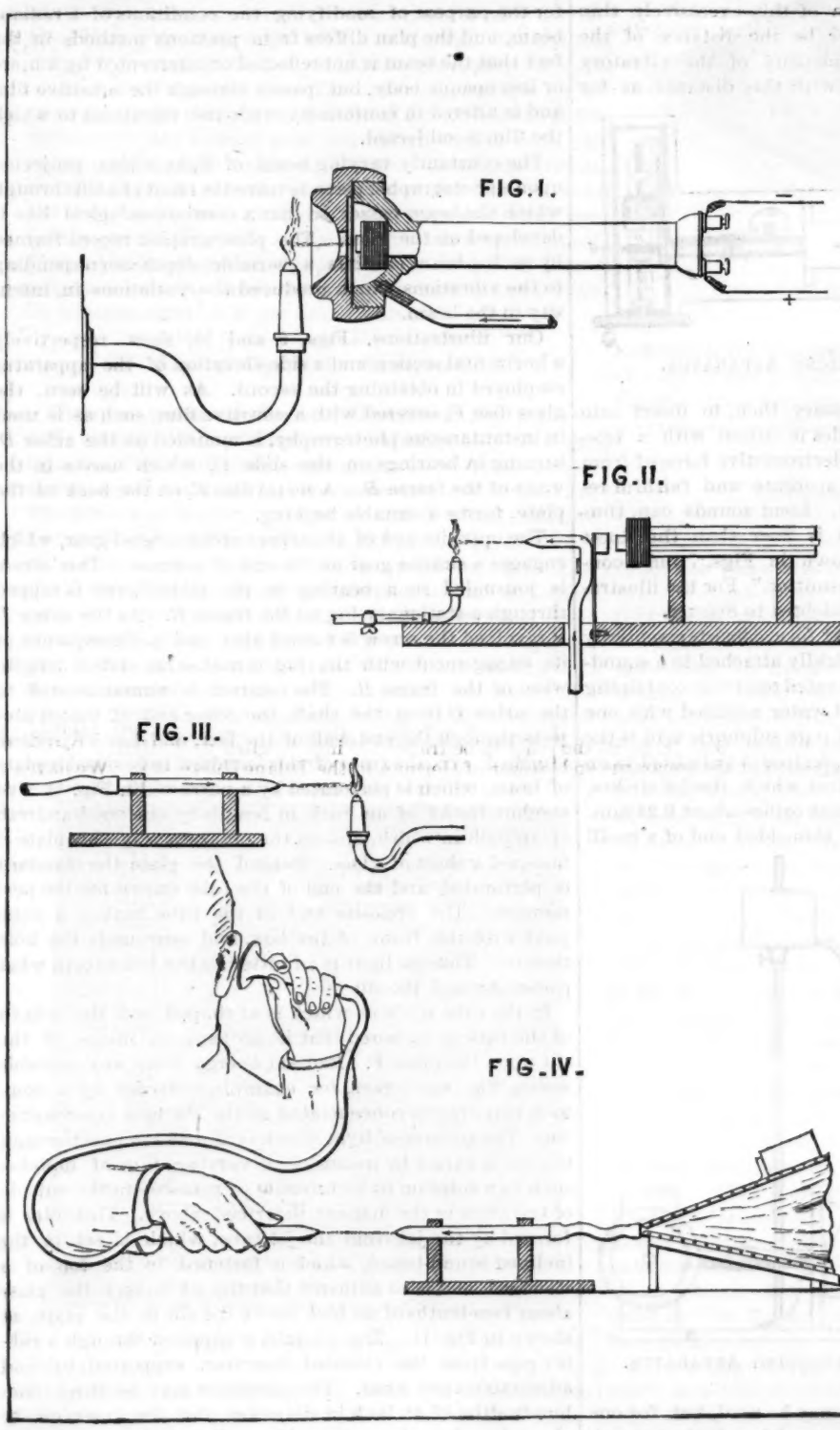
Edison's phonograph is one form of speech recorder, but, promising as the invention looks even to-day, it has, fo lack of attention, remained little more than a scientific toy. Another method of accomplishing the same purpose has recently been devised, depending upon the sympathetic vibrations of jets, which are influenced by sounds produced in their vicinity.

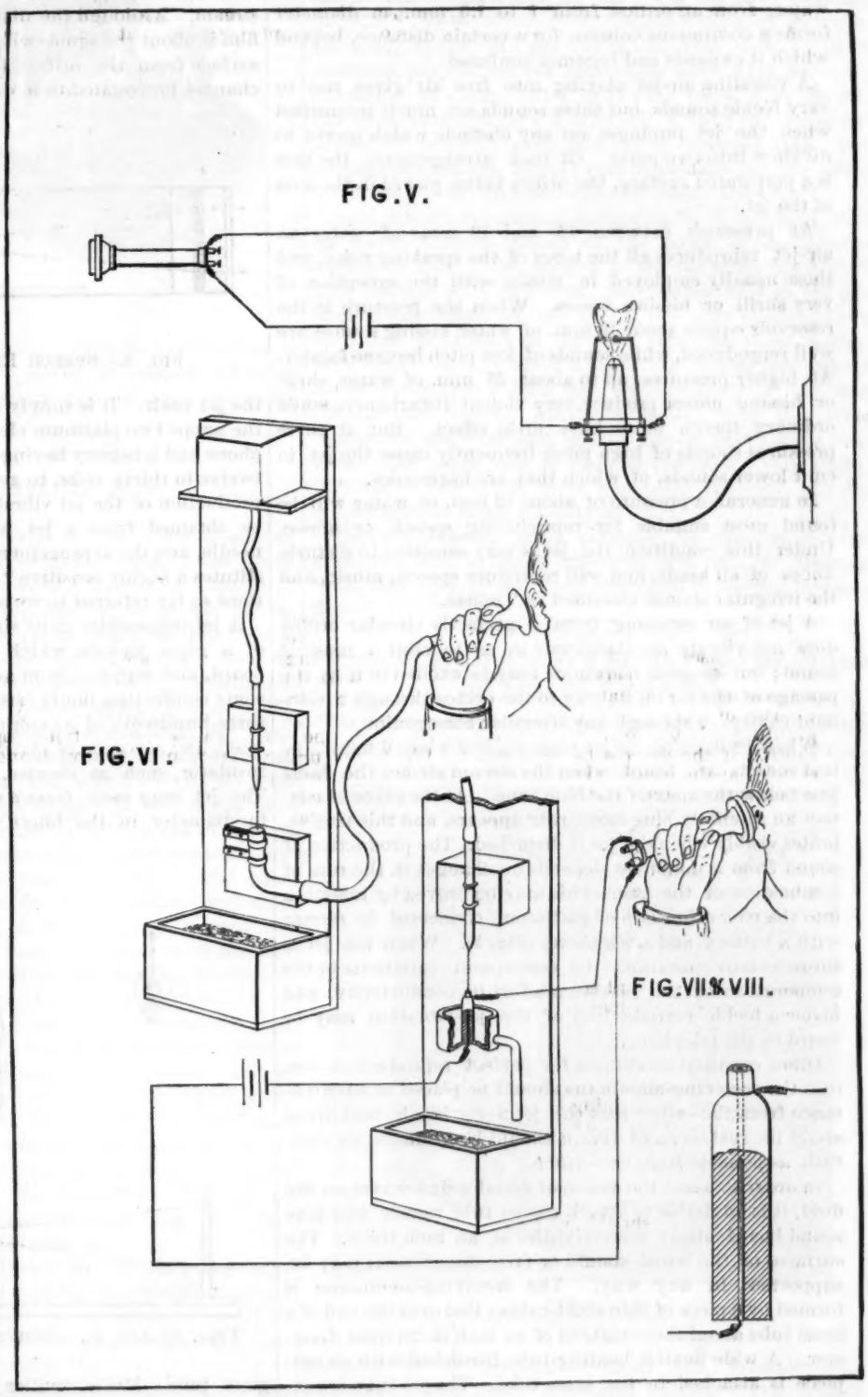
Before entering into a description of the apparatus employed, it will prove instructive to examine the studies which have led up to it, which have been prosecuted by Mr. Chichester A. Bell, Prof. A. G. Bell and Mr. Sumner Tainter, and an account of which was given in a recent lecture before the Royal Society by Mr. C. A. Bell.

After a brief historical notice of the observations of Savart, Masson, Sondhauss, Kundt, Laconte, Barret and Tyndall, Decharme and Neyreneuf, on the sympathetic vibrations of jets and flames, the author described his own experiments. Attention was directed to the subject by the accidental observation that a pulsating air-jet directed against a flame caused the latter to emit a musical sound. The pitch of this sound depended solely on the rapidity of the jet pulsations, but its intensity was found to increase in a remarkable way with the distance of the flame from the orifice. In order to study the phenomenon, air was allowed to escape against the flame from a small orifice in the diaphragm of an ordinary telephone, the chamber behind the diaphragm being placed in communication with a reservoir of air under gentle pressure, Fig. 1. Vibratory motions being then excited in the diaphragm, by means of a battery and a microphone or rheotome in a distant apartment, the discovery was made that speech as well as musical and other sounds could be quite loudly reproduced from the flame. Certain observations led the author to suspect that motion of the orifice, rather than compression of the air in the chamber, was the chief agent in the phenomenon; and, in fact, precisely similar results were obtained when a light glass jet-tube was cemented to a soft iron armature, mounted on a spring in front of the telephone magnet, Fig. 2.

Experiment also showed that an air-jet at suitable pressure directed against a flame repeats all sounds or words uttered in the neighborhood, Fig. 3. Except, however, where the impressed vibrations do not differ widely in pitch from the normal vibrations of the jet (discovered by Sondhauss and Masson), these effects are likely to escape notice owing to the inability of the ear to distinguish between the disturbing sounds and their echo-like reproduction from the flame.

In these experiments the primary action of the impressed vibrations was undoubtedly exerted on the air-jet; but a singular and perplexing fact was that no sound, or at best very faint sounds, could be heard from the latter when the flame was removed, and the ear, or the end of a wide tube connected with the ear, was substituted for it. Suspecting, finally, that the changes in the jet, effective in producing sound from the flame, must be relative changes of different parts of it, the author was led to try a very small hearing-orifice, about as large as the jet orifice, Fig. 4. The results were most striking. By introducing this little hearing-orifice into the path of a vibrating air-jet, the vibrations can be heard over a very wide area. Close to the jet-orifice they are so faint as to be scarcely audible; but they increase in intensity in a remarkable way as the hearing-orifice is moved away along the axis of the jet, and reach their maximum at a certain distance. Exper





RECORDING SPEECH BY SENSITIVE JETS.

ments with smoked air showed that this point of maximum sound is that at which the jet loses its rod-like character, and expands rapidly: it has been named the "breaking-point," because just beyond it the sounds heard from the jet acquire a broken or rattling character, and at a greater distance are completely lost. The distance of the breaking-point from the orifice diminishes as the intensity of the disturbing vibrations is increased, and also depends to some extent on their pitch and on the velocity of the jet. With orifices of from 1 to 1.5 mm. in diameter, it usually varies from 1 to 6 cm. The vibrations of an air-jet may also be heard at points not situated on the axis; but they are always most intense along the axis, and become rapidly fainter as the distance from it increases.

With glass jet and hearing-tubes, and a light gas-bag to serve as reservoir, these experiments are easily repeated; but simple apparatus for more careful experiments is described. Among the author's general conclusions from his experiments and those of others are the following:

A jet of air at moderate pressure (below 10 mm. of water) from an orifice from 1 to 1.5 mm. in diameter forms a continuous column for a certain distance, beyond which it expands and becomes confused.

A vibrating air-jet playing into free air gives rise to very feeble sounds, but these sounds are much intensified when the jet impinges on any obstacle which serves to divide it into two parts. Of such arrangements, the best is a perforated surface, the orifice being placed in the axis of the jet.

At pressures between 10 and 12 mm. of water an air-jet reproduces all the tones of the speaking voice, and those usually employed in music, with the exception of very shrill or hissing noises. When the pressure in the reservoir equals about 13 mm. of water hissing sounds are well reproduced, while sounds of low pitch become fainter. At higher pressures, up to about 25 mm. of water, shrill or hissing noises produce very violent disturbance, while ordinary speech tones have little effect. But at these pressures sounds of high pitch frequently cause the jet to emit lower sounds, of which they are harmonics.

In general, a pressure of about 12 mm. of water will be found most suitable for reproducing speech or music. Under this condition the jet is very sensitive to disturbances of all kinds, and will reproduce speech, music, and the irregular sounds classified as "noises."

A jet of air escaping from a perfectly circular orifice does not vibrate spontaneously so as to emit a musical sound; but musical vibrations may be excited in it by the passage of the air on its way to the orifice through a resonant cavity, or through any irregular constriction.

When a vibrating air-jet plays against a small flame, the best sounds are heard when the stream strikes the flame just below the apex of the blue zone. At the plane of contact an intensely blue flame ring appears, and this ring vibrates visibly when the jet is disturbed. The production of sound from it doubtless depends on changes in the rate of combustion of the gas. This may be proved by inserting into the ring a fine slip of platinum, connected in circuit with a battery and a telephone (Fig. 5). When the jet is thrown into vibration, the consequent variations in the temperature of the platinum affect its conductivity, and hence a feeble reproduction of the jet-vibration may be heard in the telephone.

Other essential conditions for perfect reproduction are, that the receiving-membrane should be placed at such distance from the orifice that the jet never breaks into drops above its surface, and that it should be insulated as carefully as possible from the orifice.

In order to assist the action of aërial sound-waves on the fluid, it is advisable to attach the jet-tube rigidly to a pine sound-board about three-eighths of an inch thick. The surfaces of the board should be free, otherwise it may be supported in any way. The receiving-membrane is formed by a piece of thin sheet-rubber tied over the end of a brass tube about three-eighths of an inch in internal diameter. A wide flexible hearing-tube furnished with an ear-piece is attached to the brass tube. The jet-tube is connected with an elevated reservoir by an India-rubber pipe (Fig. 6).

With an apparatus of this kind, and a tolerably wide jet-tube having an orifice about 0.7 mm. in diameter, a pressure of about 15 decimetres of water is required to bring the jet into condition to respond to all the tones and overtones of the speaking voice (except hissing sounds) and those employed in music. At a somewhat higher pressure it will reproduce hissing sounds. It is not easy for an untrained ear to distinguish between the disturbing sounds and their reproduction by the jet, when both are within range of hearing. Vibrations may, however, be conveyed to a jet from a distance in a fairly satisfactory way by attaching one end of a thin cord to the jet-support and the other to the centre of a parchment drum. The cord being stretched, an assistant may speak, sing, or whistle to the distant drum. Other devices for conveying vibrations from a distance are described.

Now, when the jet is disturbed in any way, and the receiving membrane is introduced into its path close to the orifice, scarcely any sound can be heard in the ear-piece; but, if the membrane be moved away from the orifice along the path of the jet, the sounds become gradually louder, until at a certain distance (which varies both with the character of the orifice and the intensity of the impressed vibrations) a position of maximum purity and loudness is reached. At greater distances the reproduction by the jet becomes at first rattling and harsh, and finally unintelligible. In the latter case the jet will be seen to break above the membrane.

From this experiment we may draw the conclusions previously arrived at for air-jets, viz., that all changes produced by sound at the orifice grow in accordance with the same law, and that all changes travel with the same velocity, which is probably the mean velocity of the stream.

One of the most interesting and beautiful methods of studying the vibrations of a jet consists in placing some portion of it in circuit with a battery and telephone, whereby its vibrations become audible in the telephone. A number of forms of apparatus for this purpose have been constructed, but one will serve as a type. Savart, in the course of his experiments, showed that the vibrations of the jet are preserved in the "nappe," or thin sheet of fluid formed when the jet strikes normally on a small surface. So far, then, as vibratory changes are concerned, the nappe has all the properties of the main stream. Although the diameter of this excessively thin film is about the same whatever be the distance of the surface from the orifice, the intensity of the vibratory changes propagated to it varies with this distance, as for

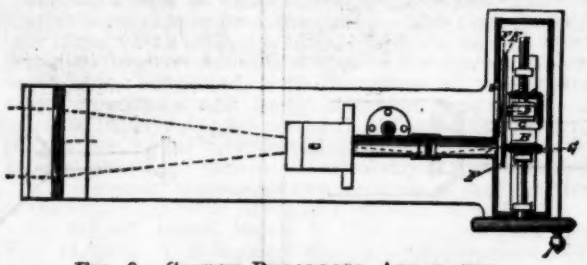
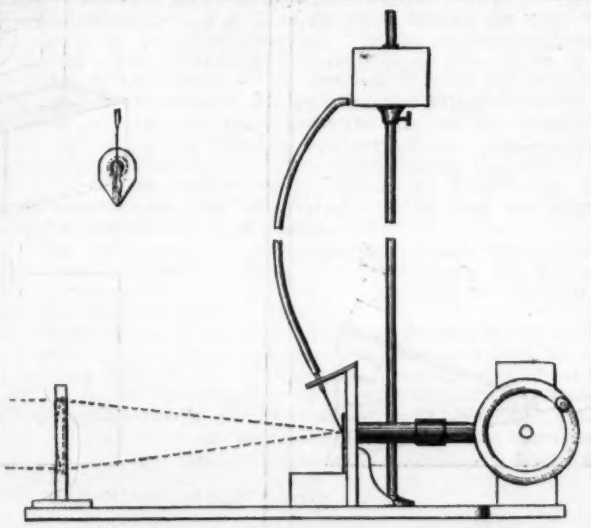


FIG. 9.—SPEECH RECORDING APPARATUS.

the jet itself. It is simply necessary, then, to insert into the nappe two platinum electrodes in circuit with a telephone and a battery having an electromotive force of from twelve to thirty volts, to get an accurate and faithful reproduction of the jet vibrations. Loud sounds can thus be obtained from a jet which is finer than the finest needle, and the arrangement shown in Figs. 7 and 8 constitutes a highly sensitive "transmitter." For the illustrations so far referred to we are indebted to *Science*.

A jet-transmitter in its simplest form consists essentially of a glass jet-tube which is rigidly attached to a sound-board, and supplied from an elevated reservoir containing some conducting liquid (distilled water acidified with one three-hundredth of its volume of pure sulphuric acid is the best), and a couple of platinum electrodes imbedded in an insulator, such as ebonite, against which the jet strikes. The jet may issue from a circular orifice about 0.25 mm. in diameter, in the blunt and thin-sided end of a small



FIGS. 10 AND 11.—SPEECH RECORDING APPARATUS.

glass tube. Much smaller jets may be used, but, for one of the given size, the pressure required for distinct transmission of all kinds of sounds will not exceed thirty inches. The receiving surface is the rounded end of an ebonite rod, through the centre of which passes a platinum wire. The upper end of the rod should be about 1 mm. in diameter, and should be surrounded by a little tube of platinum; and the end of the central wire and the upper margin of the tube should form a continuous slightly convex surface with the ebonite, free from irregularities. The inner and outer platinum electrodes are joined respectively to the terminals of the circuit. The jet is allowed to strike on the end of the central wire, and, thence radiating in the form of a nappe, comes into contact with the tube, thus completing the circuit. The dimensions of the apparatus may be varied to suit jets of different sizes; it is highly desirable, however, that the jet nappe should well overlap the inner margin of the ring-shaped electrode.

With small jets the impact disturbances are so feeble that slight precautions are necessary to insulate the receiving-surface from the orifice, unless the former is placed low down in the path. The strength of battery may be increased until the escape of electrolytic gas-bubbles causes a faint hissing noise in the telephone. The liquid, on its way to the jet, should pass downwards through a wide tube lightly packed with coarse, clean cotton, by which minute air-bubbles, which violently disturb the jet, and small particles of dust which might obstruct the orifice, are stopped. This tube should never be allowed to empty itself.

Experiments are given to show that in this instrument the jet may act upon the electric current in two ways: First, by interposing a constantly changing liquid resistance between the electrodes; and, second, by causing changes in the so-called "polarization" of the electrodes. In one form of instrument, namely, that in which both jet and electrodes are entirely immersed in a mass of liquid of the same kind as the jet liquid, the action must be entirely at the surface of the electrodes.

In the latter case a liquid jet becomes similar in structure and properties to a jet of air in air, and the velocity at different points when it is steady and when it is disturbed varies in precisely the manner already described.

With the foregoing as a *résumé* of the theory involved, we now come to the practical application and the apparatus devised for that purpose.

The sensitive jets or films described above are utilized for the purpose of modifying the conditions of a radiant beam, and the plan differs from previous methods in the fact that the beam is not reflected or intercepted by a more or less opaque body, but passes through the sensitive film and is altered in conformity with the vibrations to which the film is subjected.

The constantly varying beam of light is then projected upon a photographic plate, revolved in front of a slit through which the beam passes, so that a continuous spiral line is developed on the glass. The photographic record formed by such a beam exhibits a variable depth corresponding to the vibrations which produced the variations in intensity in the beam.

Our illustrations, Figs. 9 and 10, show respectively a horizontal section and a side elevation of the apparatus employed in obtaining the record. As will be seen, the glass disc *F*, covered with a sensitive film, such as is used in instantaneous photography, is mounted on the arbor *D*, turning in bearings on the slide *C*, which moves in the ways of the frame *B*. A metal disc *E*, on the back of the plate, forms a suitable backing.

The opposite end of the arbor carries a bevel-gear, which engages a similar gear on the end of a screw. This screw is journaled in a bearing in the slide *C*, and is tapped through a stationary lug on the frame *B*. As the arbor *D* is revolved the screw is turned also, and in consequence of its engagement with the lug it moves the slide *C* lengthwise of the frame *B*. The rotation is communicated to the arbor *D* from the shaft, the outer end of which projects through the end wall of the box, and has a fly-wheel attached. On the front of this standard is fastened a plate of brass, which is perforated by a narrow slit, Fig. 11, five one-hundreths of an inch in length by one one-hundreth of an inch in width, and on the outer face of this plate is fastened a sheet of glass. Behind the plate the standard is perforated and the end of the tube shown fits the perforation. The opposite end of the tube makes a close joint with the front of the box, and surrounds the hole therein. Thus no light is admitted to the box except what passes through the slit.

In the tube is a lens which is so shaped and the length of the tube so adjusted that it projects an image of the slit upon the plate *F*. Radiant energy from any suitable source (the sun's rays, for example, reflected by a common heliostat) is concentrated on the slit by a condensing-lens. The amount of light which is allowed to pass through the slit is varied by means of a varying film of liquid—such as a solution of bichromate of potash—on the outside of the glass in the manner described above. This film is formed by the jet from the jet-tube, which is set in the inclined sound-board, which is fastened to the top of a standard, and is so adjusted that the jet strikes the glass about two-tenths of an inch above the slit in the plate, as shown in Fig. 11. The jet-tube is supplied through a rubber pipe from the elevated reservoir, supported by and adjustable upon a rod. The jet-orifice may be three one-hundredths of an inch in diameter and the reservoir be about four feet above the orifice. Below the glass is a receptacle for the jet liquid.

In operation the wheel is turned at an even rate of speed, which gives an even speed also to those parts of the surface of the tablet which successively come opposite the hole. This is very desirable, because it gives an even exposure to every part of the surface. If the light were constant, a spiral line would be formed on the sensitized tablet of constant width and practically uniform shade, depth or intensity. On talking to or in the vicinity of the sound-board, or of the jet itself, the jet is thrown into vibration. The film over the slit varies in conformity with the vibrations impressed upon the jet, and allows more or less light to fall upon the tablet. The size of the image projected upon the tablet remains constant. It is the intensity of the light which is changed by this apparatus. After the whole surface of the tablet has been exposed, it is removed from the box and developed by any ordinary photographic means. In this way a very perfect record can be obtained of sound-vibrations. The vibrations impressed upon the jet are also by it amplified as they are propagated lengthwise of the jet, so that the effective variations in the jet film are increased. This amplification further tends to improve the record.

The spiral line of the photographic plate when developed is one of varying thickness of film, and, hence, when this

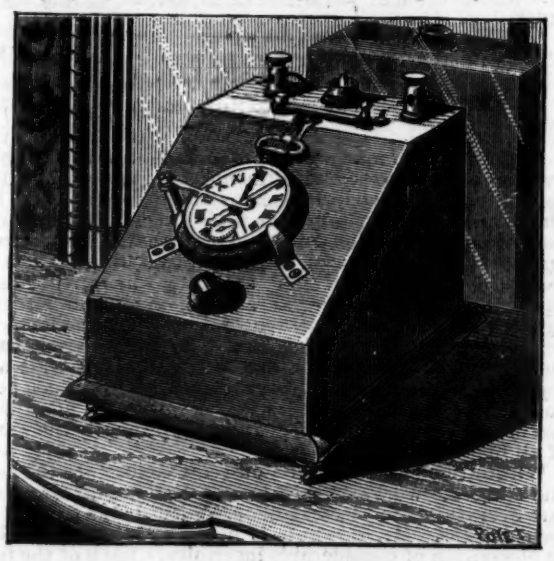
plate is interposed in a microphonic circuit and revolved, the pressure between the carbons is correspondingly varied, and the original sounds are repeated in the telephone.

Electromotive Force of Zinc Copper and Lead-Platinum Couples.

From a large number of determinations of the electromotive force of the currents yielded by zinc copper and lead-platinum couples in various simple saline solutions, B. C. Damien—*Ann. Chim. & Phys.*—finds that the electromotive force, as a rule, decreases with the time the couple is immersed. In the case, however, of the zinc-copper couple in solutions of the chlorides, the electromotive force at first slowly increases. The electromotive force of the current yielded by a zinc copper couple in a solution of magnesium sulphate it very constant, scarcely varying 0.017 volt during twelve months, and is not appreciably affected by changes either of the strength of the solution or of temperature. By introducing an exterior resistance of 20,000 ohms, the current becomes practically invariable, even when the couple is kept in circuit. The author proposes to employ this couple for the generation of currents of standard strength. The zinc-copper couple yields currents whose electromotive force is almost identical for members of any class of salts containing a given acid, but varies greatly with a change of acid. Amalgamation of the zinc slightly increases the electromotive force at first, but it decreases more rapidly than is the case when unamalgamated zinc is employed. The current obtained from a platinum and amalgamated zinc couple in dilute sulphuric acid has its maximum electromotive force when its solution contains 30 per cent. of acid.

Electricity in the Household.

The apparatus shown in our illustration, Fig. 1, represents what its inventor terms a "chronophone." It is designed so that an ordinary watch may serve as an electric alarm, and it constitutes at the same time a watch-stand. The interior of the box contains an electric bell and two Leclanché cells in the moist form, by saturating sand with the sal-ammoniac solution. This prevents the spilling of the liquid of the cell in the ordinary form. At the upper part of the apparatus is a small hook which serves to hold a watch, the glass of which is perforated by a very small hole in the centre that holds a metallic rod. The object of this rod is to establish an electric contact whenever it is touched by the hour hand of the watch. It can be attached so as to be immediately above the dial-plate, and can be set to any hour by revolving the glass which insulates it



THE "CHRONOPHONE."

and to which it is fastened by a rivet. A small flexible steel arm extends from the side of the watch and establishes connection between the rod and the battery. The other pole of the battery is led to the hook which holds the watch.

It is evident that whenever the hour-hand comes in contact with the small rod fixed under the glass, the circuit is closed and the bell rings.

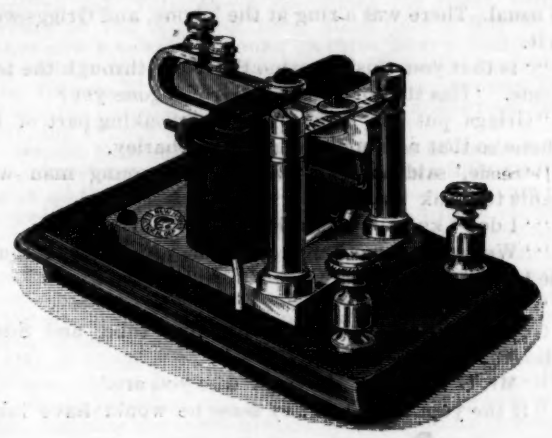
A small switch on the top of the stand is provided for the purpose of throwing the current upon a wire leading to a distant apartment when desired, so that a bell situated at another point can be rung. In the same way the two push-buttons are provided so that the bell in the box can be rung or that in another apartment at will. The little apparatus evidently is adapted to quite a number of uses.

Our illustration, Fig. 2, for which, and the above, we are indebted to *La Nature*, represents a novel form of electric lighter. It consists merely of a box containing two Leclanché cells. By pressing the push-button at the top, the current is sent through a fine spiral of platinum, which is heated red-hot and ignites the wick of a small petroleum lamp placed below it.

Fines Well Employed.—The manager of the Troy & Greenfield Railroad is using the fines levied upon his telegraph operators for the purchase of books upon electrical science for their instruction.

A Novel Sounder.

There seems to be a general tendency at the present time to avoid the use of pivots resting in adjustable trunnions in telegraph instruments. This idea is well exemplified in one of the more recent forms devised, and shown in the accompanying illustration. In this sounder, which is made by the New Haven Clock Company, the hammer is suspended by a flexible steel strip held by screws on two posts. The strip is bent down to a right angle, the lip thus formed being let into the body of the hammer, as shown. The retractile spring can be adjusted by means of the thumb nut at the front end. By this method of



NEW SOUNDER.

suspension the uncertain friction of pivots in trunnions is eliminated and a clear, sharp sound is emitted, while at the same time the cost of construction of the instrument is considerably reduced.

The Lowell Syndicate Suits.

Evidence is still being taken in the Lowell telephone syndicate suits, and dealing with the claim of the syndicate for back salary. On June 4, Treasurer Charles J. Glidden, of the Erie Company, testified as to the true inwardness of the several telephone deals, having been a participant in them from the very beginning. First he became connected with the telephone making experiments with Professor Bell between Boston and Manchester, N. H., and he went into the business in Lowell in 1877. Mr. Glidden then related the connections of the syndicate, Ingham, Downs, Coburn, Bent and himself, which had to do with all companies from the Lowell district in 1877 to the consolidation with the New England in 1883, and afterward with the Cleveland, Northwestern and Southwestern companies, which were consolidated into Erie. The companies—Granite State, Bay State, Suburban, Boston & Northern and National Bell of Maine—which formed the New England, were purchased by the syndicate for $1,296,000, watered by them $1,688,000, making $2,984,000. New England was then capitalized at $12,000,000. "As far as I know, I paid Mr. Bent for all expenses which he incurred while on the company's business. Never refused to pay any claim he made for expenses. Never heard of any claim which he had against Erie until after this suit was brought. Mr. Coburn had but very few shares when he was an officer of the companies up to Aug 16, 1882. After that time he became one of us. We called Mr. Bent 'the Justice.' I was treasurer. We sort of looked upon Mr. Coburn as the financial man. Mr. Ingham was the final judge in all matters."

Gen. Butler—Did you ever hear Mr. Ingham say anything to "the Justice" about keeping the syndicate out of Sing Sing?

Mr. Glidden—I have heard Mr. Ingham make that remark, as a joke as I understood it.

Q. Well, how did that remark come about? A. When we had been planning some particular scheme, which I cannot mention, I think Mr. Ingham has remarked: "Well, Justice, keep us out of Sing Sing," in a sort of off-hand way.

Q. At any time you went out to organize these companies did you pay the expenses of the party? A. Yes, sir.

Q. From the beginning to the end, did Mr. Bent ever charge the syndicate any expenses for his legal services? A. No, sir, not to my knowledge.

Q. Whether the only reason for having Mr. Bent in the syndicate was because he was a lawyer? (The question was objected to by counsel and was not pressed.)

Q. Mr. Bent has sworn here that he paid in cash between $12,000 and $13,000 to the Northwestern Company. How much did he pay in? A. My cash-book shows that he paid $6,250.

Q. Ever any more? A. He may have bought stock, but not in the syndicate, sir, to buy the property.

Q. Is this your cash-book as treasurer of the several syndicates? A. Yes, sir; that is what we called the pool-book.

Q. And contains the transactions of each one of the companies? A. Yes, sir, with the exception, perhaps, of one or two of the very earliest companies.

Adjourned, to meet in Lowell, June 29.

The Brighton, England, Electric Railway.

This line has been in constant operation over two years, and we now, says the London *Electrician*, give some particulars as to the result of the working during this period. The line is rather under a mile in length, and includes some heavy gradients on sharp curves, the gauge being 2.9. The speed is limited to eight miles an hour, but a speed of over twenty-five miles has been obtained. The current is transmitted along the rails, which are fastened to wooden sleepers resting on the shingle, no special insulation being used. Each car seats thirty passengers, and the motor can draw another if necessary.

The plant comprises two cars fitted with motors; one 8 horse-power gas engine, one 12 horse-power gas engine, one Siemens D2 series dynamo, one Siemens D2 compound dynamo.

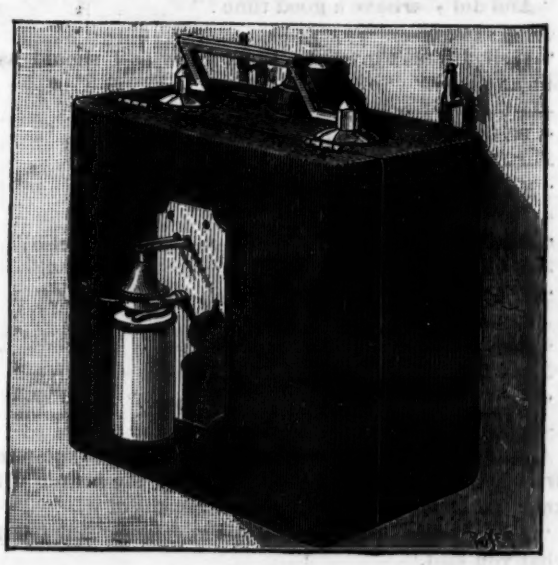
The working expenses for one year are as follows (average for two years): Electrical machinery—new commutatators and brushes, £10 0s. 6d.; gas engines—refacing slides, etc, £6 9s. 10½d.; oil and waste (that used for axles included), £10 1s. 3d.; gas (including that used to light premises, price 3s. 3d. per 1,000 cubic feet), £114 3s. 0½d.; attendant, 52 weeks, at 18s., £46 16s.; total, £187 10s. 8d. The gross earnings per car mile are 1s. 7½d.; the gross expenses (all renewals being paid out of revenue), 11½d.; car mileage per annum, 23,475; cost of haulage per car mile, 1.92d., barely 2d. (this includes the engine attendant).

Only one car is running, except on bank holidays, etc., on which occasion nearly all the power of the 12-horse engine is used. The repairs to the electrical machinery only amount to 5 per cent. per annum, and to the gas engine only about 2½ per cent. The only repairs to the electrical machinery of the two cars—the work having been nearly equally divided, each car having run about 25,000 miles—have been one new commutator and one spindle bush relined with soft metal; that, therefore, represents the wear and tear for nearly 50,000 miles running. The extra cost of running two cars is very slight, only about two-thirds more gas being required, and the other expenses being scarcely affected.

The above result must certainly be considered very gratifying both to the proprietor of the line, Mr. Magnus Volk, and also to all those interested in electric locomotion.

Success of Electricity as a Motive Power for Surface or Elevated Railroads.

The Sprague Electric Motor Company, of No. 65 Fifth avenue, New York City, made an exhibit of their system



ELECTRIC IGNITER.

recently to a committee from the Massachusetts Legislature and other interested parties. The branch track of the Third Avenue Elevated Railroad on Thirty-fourth street was used to illustrate the system. A common middle rail was laid for a conductor of the current. The motors were applied to the trucks of a regular elevated car, and the electricity was generated three-quarters of a mile away, on Twenty-fourth street, being conveyed on a small ordinary wire. The experiment was a perfect success in every way, and the committee were very enthusiastic in their demonstrations. This test, says the Boston *Journal of Commerce* of May 29, settles the question of applying electricity as a motive power to surface or elevated railroads. It is now in practical operation and will be run regularly in two weeks' time. Arrangements are being made to equip the whole elevated railroad with this system. To show how the matter is looked at by practical mechanics, the locomotive engineers on the elevated railroads in New York have been watching this experiment with great interest, and the question they are now asking themselves is, "What will become of our occupation when this comes into general use?" There is no longer any doubt that eventually the days of using locomotives on elevated railroads, also steam railroads, are numbered. In New York it is becoming an absolute necessity to make some change with the present system of using locomotives, as the capacity of the elevated railroads has been reached. They now run

four cars with a locomotive, and the strength of the elevated structure will not bear any more weight. By using electric motors under the cars the weight of trains can be reduced one-half. This will allow a middle track to be laid to run express trains. It now seems to be only a question of time when we shall have elevated railroads run by electricity in Boston and vicinity. It is bound to come, and where is there more need of such a system? Take the present system of conveyances from Cambridge or Roxbury by horse cars. There has been a feeling that relief would be obtained by the Meigs elevated system using steam locomotives, but the last experiments made in Cambridge on the Meigs trial railroad have proved to be complete failures. The rails have been twisted all out of shape by the immense weight of the locomotive, and extensive repairs have been required after every trial. Again the public at this time do not want locomotives with all the dust, dirt, cinders, gas and smoke in their streets. The question is often asked, at what speed can cars be run with electricity. There is practically no limit to the speed. It will depend on the requirements of the public. In elevated railroads the strength of the structure will be the principal question in addition to safety. On surface street railroads the speed will probably be limited by law.

A New Industry.*

BY LUKE SHARP.

At fifty minutes past noon one day, a fortnight since, I saw a friend of mine walking slowly up and down in front of the building in which his office was situated. He had a discontented look on his face.

"What's the matter?" I said. "On strike?"

"No; I'm tired; that's all."

"Why don't you go to your office and sit down there?"

"Because our type-writer girl is at the telephone. That's what makes me tired."

"How is that?"

"Why, aren't you on to the telephone flirtation business? It's awful, my boy, awful. What's worse, its spreading every day. Cholera is nothing to it."

"Don't think I understand you."

"Well, come up with me. You'll understand it. She has about seven minutes more. She won't mind us."

We went up and entered the office. A handsome young lady with a fixed sentimental smile on her face stood at the telephone with the bugle at her ear. She was listening so intently that she paid no attention to us—evidently did not know we came in.

"It affects 'em all that way," said my companion in a whisper. The following conversation took place:

"And did you have a good time?"

——— ——— ——— —

"Well, I wasn't invited. Don't know as I should have gone any how."

——— ——— —

"Would you? I wouldn't."

——— ——— ———

"No, indeed, I should think not."

——— ——— ——— ———

"Why, was she there? Well, I never! Who else?"

——— ——— ———

"Now your joking. I don't believe a word of it."

——— ——— ——— ——— ——— ———

"Because I know she wasn't."

——— ——— ——— ——— ——— ———

"Never you mind, I know all the same."

——— ——— ——— ———

A silvery laugh was then laughed by the type-writer girl. The laugh was directed so that the hearer at the other end of the line would get the benefit of it.

"Now, you're just too mean for anything. I'll tell her what you said."

——— — —— ——— — —

"Yes, I will; see if I don't."

——— ——— ———

"No, I haven't seen him since last— Hello, Central!—We're not through talking yet—What's that?—I haven't been talking for an hour—No; nor pretty near it either—Well you've no business cutting in till we ring the bell. Hello, Cholly! Ain't they horrid at the Central office? That's the fourth time."

——— —— ———

"That's what I told her. I believe they listen to every word we say."

——— ——— ———

"Oh, I don't care. Well, good-bye. Say, call me up at 12 to-morrow; will you, Cholly?"

——— — — —— —— —

"All right. Good-bye, Cholly."

The girl gave the requisite jingle at the bell to let the Central office know she had finished talking; then she went to another room, and as 1 o'clock struck we heard the rat-tat-tat of her type-writer.

My friend heaved a deep sigh of relief.

"That sort of thing goes on in nearly every office in Detroit that has a telephone and a girl. Who the fellows are I have no idea. Guess they are clerks and young jackanapes in offices. Almost every place has a telephone, and so they call up lawyers' offices, or insurance offices, or any place where girls are likely to be at the time the proprietors are out, and that sort of vapid nonsense goes over the wires. If old Griggs tumbles on to it in this office there'll be music. The only pleasure I take in living just now is the hope that Griggs will be called up by 'Cholly.' If Griggs is in his usual ill-humor, 'Cholly' will think he's struck by lightning."

I intended to interview the folks up at the central telephone office on this great and growing industry, but I forgot about the subject until I met my friend again, a week after our first talk.

"Old Griggs got on to that telephone racket," he said, joyously.

"How did that happen?"

"Oh, the old man stayed some time after 12 on Tuesday. We had a rush that day, and he didn't get off as soon as usual. There was a ring at the 'phone, and Griggs went to it.

"'Is that you, Susie?' came the voice through the telephone. 'Has that old bear of a Griggs gone yet?'

"Griggs put his hand over the speaking part of the 'phone so that no sound could get to Charley.

"'Susie,' said Griggs, 'who is this young man who wants to speak to you?'

"'I don't know,' said Susie, unblushingly.

"'Well, just come here a moment. Now say through the telephone "Who are you?" Understand?"

"'Yes,' said Susie.

Griggs took his hand off the speaking tube, and Susie, who was a wide-awake girl, cried:

"'Mr. Griggs wants to know who you are.'

"If the youth had had any sense he would have taken

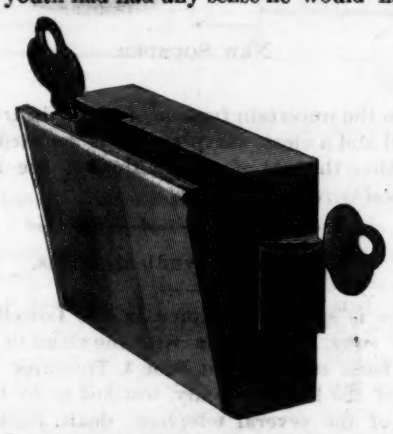


FIG. 1.—LOCK—NEW POLICE ALARM SYSTEM FOR NEW YORK.

the hint. But what can you expect from a fellow who flirts through a telephone.

"'Tell the bald-headed old idiot, Susie, that it is Charley Spry, office of Grab & Fleece, Griswold street.'

"Young man," cried Griggs in his deepest voice, "you are talking to the old idiot now and not to Susie. The old idiot will take pains to see his idiotic friend Grab, and the chances are you'll be talking through another telephone next week. I hope Susie will have sense enough to cut the telephonic acquaintance of a young idiot who hasn't gumption to take a hint when he gets it."

"Now Griggs has the telephone boxed up and he keeps it locked from 12 to 1. Oh, no, he said nothing to Susie. She works the type-writer yet and will, I guess, but Cholly was bounced."

Detroit Free Press.

A Police Alarm System for New York.

It is now several months since the system of police alarm, similar to that of the fire alarm, has been in operation in

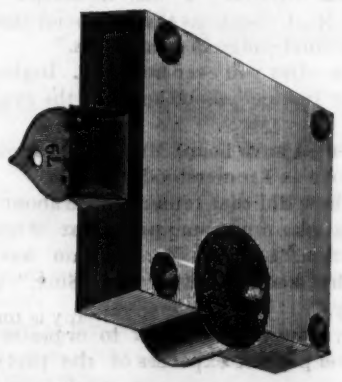


FIG. 2.—LOCK—NEW POLICE ALARM SYSTEM FOR NEW YORK.

the uptown sparsely settled districts of New York, and the success obtained is so decided that it is now being extended, and will eventually include the whole city. There are at present nearly 150 alarm-boxes in operation by which aid can be summoned from the different police stations. The system employed is that of Messrs. Pearce & Jones, of this city, familiar to our readers, and it is also in operation in Yonkers, St. Paul, Minn., and other places.

As in the fire-alarm boxes, the keys to the boxes are numbered, and when inserted and the cover is opened the key is trapped by the lock and cannot be removed without the aid of another key in the keeping of an officer. Ordinarily the lock is secured to the lid by screws, which can be removed and the key taken out by evil-minded persons, but, in order to prevent this, Messrs. Pearce & Jones have devised a lock in which the screws are covered. This is shown in Fig. 1. The lock is arranged so as to trap the key-hole, and over the whole closes the hinge door provided with a Yale lock. This covers the screw heads and makes their removal impossible. The opening of the hinged lid permits the key to be released. Another form of lock which requires no master key is shown in Fig. 2. In this the key is removed by the aid of a combination lock shown.

Receiver Farnsworth's Suit for $2,000,000 Damages.

This suit against the Western Union is still going on. The most important evidence given recently is that of Walter P. Phillips, manager of the United Press Association. Strenuous objections were made when Mr. Lauterbach asked him if he had received any information that the seizure of the Bankers & Merchants' wires was to be made. Manager Phillips said he was told by Wm. B. Somerville, superintendent of the transmission of press dispatches of the Western Union Company. Mr. Choate and Judge Dillon contended that he could not testify if he never had seen a written order or heard verbal instructions given Superintendent Somerville by the Western Union Company. After quibbling for some time Judge Lawrence asked the witness if he knew that Mr. Somerville occupied the position described.

"I know it as well as I know anything," said Manager Phillips. He explained that he had made contracts with Somerville, and talked over business matters with him. Then he was permitted to answer. He said in substance:

"From time to time after the failure of Mr. Dimock, of the Bankers & Merchants' Company, I talked to Mr. Somerville about the prospect of my making arrangements with the Western Union if anything happened to the Bankers & Merchants.' He had been my predecessor in the United Press Association, and was very friendly to me. He had told me that the Western Union was likely to get hold of the American Rapid wires, and I asked him to let me know in advance when they were likely to take them so that I could make some arrangement for my business. On July 10, 1885, about 2 o'clock, more than an hour and a half before the cutting of the wires, Mr. Somerville came to my office. He said he had come to tell me privately that he was satisfied that the Western Union was likely to take the American Rapid wires. I asked him when it would be done, and he said, 'I think to-day.'"

This was regarded as a good point for the Bankers & Merchants,' because it showed that, while it was known by the Western Union officials that an order would be made for the American Rapid property to be turned over, no notice was given to the Bankers & Merchants,' so that they might make provision for carrying out the order.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, June 7, 1886.

Happening to make a round of calls up-town recently, I was forcibly impressed with the number, variety and importance of the electrical concerns there located. To begin on the northern limits, one finds at One Hundred and Forty-fourth street and Fourth avenue the large and growing works of D. Rousseau, manufacturer of all kinds of electrical appliances, his specialty being domestic equipment, such as burglar alarms, annunciators, gas-lighting cut-outs, automatic gas-lighters, pendant burners, letter boxes, door openers, etc. The numerous departments include a molding room for castings in brass and copper. The demand for his goods is so brisk that he is now behind his orders, but with the help of additional machinery just put in he hopes to meet promptly the wants of all his patrons.

Within two blocks of the Rousseau factory are the new and elaborate works of R. Edwards & Co., who manufacture everything in electrical house furnishings from their own designs. Mr. Edwards is not only a contractor, but an electrician of considerable ingenuity. Each of the four stories of the building is devoted to some specialty. The hum of the great wood planers and molders can be heard far above the noise of the ponderous locomotives passing. Mr. Edwards has a little surprise in store in the shape of an annunciator without drops. Many of the productions from this place can be seen at the offices, 171 Broadway.

The next point is the great Wood-working company's factory on 134th street and Alexander avenue, where they turn out electric light molding and cabinet work of any kind or design for office, house and other furnishings. Any description of plain or fancy wood-work can be had to order on very short notice. Then, leaving the far side of the Harlem, a short walk takes me to 2257 Third avenue, where Mr. Thomas Farrell receives orders to fit up house or office with electrical or mechanical bells, annunciators, etc., of his own make. Still coming southward, I drop into Waite & Bartlett's busy establishment at Twenty-third street and Third avenue, where they are just now turning out a number of medical electrical machines. Dr. Waite is actively at work preparing plans for his new static machine. A big machine, costing $450, was sent to the West a few days ago, and another large one in the office is also sold, at which I do not wonder, as it is an admirable piece of construction in every respect. Not very remote, at 424 E. Twenty-third street, is the large foundry of Jas. J. McKenna & Brother, for casting brass and copper in any quantity. They guarantee all their work. The last samples I saw of it were some fine spiders, cast for the machines of the American Electric Manufacturing Company. They also make metal parts of medical batteries for some of the best concerns in the city.

Near by, again, is the Galvano-Faradic Manufacturing Company at 300 Fourth avenue, as busy as ever making its electro-medical specialties. Business has been very satisfactory since the goods were brought to the notice of your readers. Something new is now in hand of which I am

not at liberty to speak. At 6 W. 14th street is Mr. A. T. Smith, who is busy furnishing his new lava tips for multiple electric gas lighting; and the little jaunt I have outlined may close fittingly at Mr. Bogart's well-known establishment, 22 Union Square. It will be seen that just one line of travel in New York City will touch many places of interest to electricians generally. I might take the other side of town just as fully, but will only seize the occasion to mention that a new firm has started 'way up in the seventies—McCabe & Crawford, who have opened a very attractive store at 1155 Ninth avenue, near the Seventy-second street elevated station. I believe they are the electricians nearest to the North Pole on their side of the city, but if building thereabout goes on as it now promises to do, they will soon find their enterprise yielding them a rich return. The firm do everything in the alarm, annunciator and bell line, will put up private telegraph and telephone lines, and are authorized to do wiring under the Edison system. Mr. Crawford is an interesting genius of marked ability and great force of character. He did much to place the telephone on its feet in Russia, and has of late been modestly putting some good work that will tell into the electric motor. The firm are eminently deserving of success, and I think they will win it in liberal measure.

Speaking of uptown reminds me that the electric light continues to gain in favor. I predict that soon it will be a downright necessity in all new apartment houses. Thus, on the west side, the Dakota has the Edison system, the beautiful new Evelyn flats are lighted by electricity throughout, and now the new Rosalie flats, not quite finished, near Fifty-ninth street on Ninth avenue, are to have an Edison plant.

Mr. George H. Pride, the electrical engineer and contractor, about whose plans I gave some details a few weeks ago, has moved from 18 to 9 Dey street.

Mr. D. W. Crosby, the New York manager of the Electrical Controlling Company, 58 Fulton street, tells me they have made an extensive purchase of land near Metuchen, N. J., whither they will remove their works from Elmira as soon as the new factory can be finished. They will there manufacture Mr. Rosebrook's many valuable patented articles, such as his electric controlling hatchers and brooders, automatic heat regulators, thermostats for brewers, watchmen and police fire detectors, automatic fire extinguishers, heat recorders and indicators, electric alarms for hotels, steam boilers, etc., foul gas indicators and alarms for mines, and so on.

Westinghouse, Church, Kerr & Co. now have a Westinghouse plant running in the basement of the building in which their fine suite of offices is located, 15 Cortlandt street. I have already made some note of this plant. Several of the small and large lights have been taken by the restaurant on the same floor, and the effect is inexpressibly agreeable. Every time I go up and down the street I see people looking into the restaurant and praising the lights very audibly. In the Westinghouse offices the replacing of gas by electricity makes a pleasant change in the atmosphere and the light. It is instructive to look at the big, long, black smudges up the walls where the gas jets were burning formerly. No more forcible object-lesson could be wanted as to the manner in which gas spoils the finest decorations and furniture.

The United States Illuminating Company has been able to make a splendid exhibition of the flexibility of its system, by the use of its arc lights in the operations required for the enlargement of the Equitable building, 120 Broadway. All over the immense excavation at all altitudes and at points where no other light would be available, the lights are in use every night, and the assistance they render is very highly appreciated by the contractors engaged on the work. A few blocks further up Broadway, in the well-known "Common Sense" restaurant, opposite the Post Office, some of the Weston large incandescents have been put in by the enterprising proprietors, who assure me that they and their customers like the lights very much.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Mass., June 7, 1886.

The New England Pottery Company, East Boston, deserves notice from the electrical fraternity who require a fine grade of porous cups, for the reason that this concern makes this line of goods a special branch of its pottery business. There are several battery manufacturers in Boston who have been purchasing porous cups steadily for two years past from the above company.

The Jarvis Engineering Company has its time well taken up filling orders for the Armington & Sims engine, for which it is the Boston agency. Among its recent sales is a very attractive and powerful engine of the aforesaid make, which goes to Woburn, Mass., to run the electric light plant installed some time ago by one of the most enterprising citizens of that small but wide-awake town.

A new company has been incorporated in this city for the manufacture of electric light and power apparatus and electrical supplies, with Mr. T. C. Frenyear, President; L. E. Razee, Treasurer. Messrs. J. S. Fillmore, Gustav Pfannkuche and the two first-mentioned gentlemen are the directors. The capital is said to be $150,000. It will be known as the Frenyear & Razee Company.

The New England Wiring Company, of this city, has for several years done most of the wiring for the electric light stations and isolated plants installed in the New England States by the Edison Company. The work done by said company is of a very superior grade, and the highest encomiums have been meted out to Mr. Walter Paine and his assistants for their painstaking handiwork and the satisfactory results of their labor.

The annual meeting of the Boston Electric Register Company was held at Kittery, Me., on the 3d instant, when the following gentlemen were elected Directors: H. M. Cable, W. H. Lee, Thomas E. Faunce, Richard M. Johnson and William Meehan. Subsequently Mr. H. M. Cable was elected President, and Mr. Thos. E. Faunce, Treasurer and Secretary. The stockholders are so confident of the merits and great value of their property, that all the money required to push their enterprise throughout the country will be forthcoming.

The Municipal Signal Company during the past week gave two very interesting and satisfactory exhibitions of its system in South Boston, under the supervision of the Police Commissioners and nearly all the superintendents and captains of the Boston police force. Mr. John C. Wilson, the inventor, and treasurer of the company, thoroughly explained and demonstrated the operation of the system, and everything worked smoothly and satisfactorily. The entire apparatus of the system was fitted up several weeks ago and has been ready for business about two weeks. All that is requisite before the system is put into operation is the favorable report of the officials above mentioned, and this is now assured.

The piazza of the Country Club House, Clyde Park, Brookline, Mass., was lighted by incandescent lamps run by Volta Pavia batteries on the occasion of the lawn party, June 3, but the heavy rain prevailing at the time slightly interfered with what would have been a brilliant exhibition of electric lighting by primary batteries. To demonstrate the usefulness and practicability of its system, the Chemical Electric Light and Power Company again visited the club-house on the following Friday and Saturday evenings and lighted up the piazzas and hallways to the satisfaction of the members of the club.

Mr. Leon N. Loeb, Church alley, London, E. C., controlling the Volta Pavia inventions for Great Britain, writes to the company here, under date of May 20: "I have now reached 206 hours, on three 16 c. p. lamps from 20 cells." Mr. Simon Hamburger, formerly manager of the Toronto Electric Light Co., and now controlling Volta Pavia for Canada, is also making independent tests and is running 25 cells on public exhibition.

Messrs. Kimball & Davis, the new firm of manufacturing electricians in this city, have their shops fully equipped with all the necessary machinery and tools, and are prepared to turn out at short notice any kind of electrical apparatus or electric light supplies. Both members of the firm are experienced and expert engineers and electricians, and they intend to make as the most important branch of their business the constructing, equipping and fitting up electric light stations and plants (both arc and incandescent) of any capacity.

Mr. F. H. Angell, formerly with the American Electrical Works, and at present representing the Kerite insulated wires and cables, was in Boston during the past week. Mr. Angell is the same urbane and courteous gentleman to-day that the writer has always known him to be; and his large circle of friends among the electrical fraternity will be gratified to learn that his health and business prospects are as good as could be desired.

At the State House, in the Senate, the Committee on Street Railways has reported leave to withdraw, on the petition of H. H. Hutchins and others, for incorporation as the Boston & Somerville Elevated Railway Company; also leave to withdraw, on the petition of John W. Candler and others, for incorporation as the Boston Elevated Railway Company.

It is reported that the Electric Lighting Company of Rutland, Vt., has increased its capital stock from $5,000 to $50,000. This will be divided into 2,500 shares of $20 each, and be sold, as far as possible, to residents of Rutland and vicinity. The increase was made, it is said, to enable the company to put in an extensive plant for lighting the entire town and suburbs with both arc and incandescent lamps.

The Stuart Electrical Supply Company has been organized at Portland. The company is capitalized at $250,000; 10,000 shares at $25 each.

The Mather Electric Company, of Hartford, is to increase its shares from $50 to $100, and reduce the number from 4,000 to 2,000.

Among the recent shipments of the Fitchburg Steam Engine Co. are a 125 horse-power engine to J. H. Horne & Sons, Lawrence; a 100 horse-power engine to the Electric Light Company, Stamford, Conn.; an 85 horse-power to Matthew Robson, Salem, and they have just added the fourth to those already in S. D. Warren's mills, Cumberland, Me.

The business of the Electric Gas Lighting Company has increased to such an extent that the company has been compelled to secure a new factory in this city, equipped with new and improved machinery specially adapted to manufacture its electric gas lighting apparatus and other electrical appliances.

PROVIDENCE, June 8, 1886.

A new and improved machine for braiding large cables, on an entirely novel principle, will soon be ready to place on the market by the R. I. Braiding Machine Company.

Mr. E. B. Baker, of New Haven, a representative of the Southern New England Telephone Company, has been spending several days in this city on important business matters in the interest of his company.

The R. I. Telephone and Electric Company of this city has increased its facilities for the manufacture of the popular "Little Giant Battery," and will also enter into the making of several electrical novelties. Through its Boston agent, Mr. Chas. L. Bly, the company recently sold 300 "Little Giant" batteries to the Judkins Railway Train Signal Company, for use in connection with the signal apparatus of that company.

Messrs. Geo. H. Adams & Co. report business in their line as being very satisfactory. The firm is at present doing considerable wiring work, and is engaged upon the equipping of several arc and incandescent plants for prominent electric lighting companies. The senior member of the firm spends a good deal of his time attending to the testing of electrical apparatus and to the measurement of dynamo machine capacity.

The Harris-Corliss Engine Company is making extensive improvements at its works. The office building is being enlarged and refitted, and the drafting room will be extended so as to occupy the entire second story of said building. This company is now figuring on quite a number of engines for electric lighting stations.

Mr. E. M. Carhart, the manager of the Holmes Burglar Alarm Company for this section, gives the encouraging report that business is looking up in his line, as well as for the prominent business concerns with whom he has dealings. It is a well-known fact throughout the city that wherever the Holmes burglar alarm apparatus has been applied, neither a robbery nor fire has occurred or is likely. Mr. Carhart is the patentee and manufacturer of the well-known Carhart cable clip, for swinging telephone and electric light cables, a very simple, durable and cheap device.

A dynamo oil for lubricating electric dynamos, of a very fine quality, is being manufactured by the A. W. Harris Oil Company, of this city. This oil combines all the requisite qualities for lubricating the different makes of dynamos and is a first-class lubricant. The same company manufactures a fine brand of engine oil for external lubrication of the engine and shafting, and the A. W. Harris valve oil for lubricating valves and cylinders of high-speed steam engines. Both these oils have a widespread reputation for being highly desired lubricants. The company has recently enlarged its premises, which gives it one of the largest and most completely stocked oil depots in this country. This, together with an extensive warehouse and its increased facilities, enables it to fill all orders satisfactorily and promptly.

W. I. B.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, June 5, 1886.

The order for the belting to be used in connection with the great New Orleans arc light installation has been placed with Munson & Company, of Chicago. The important belts are sixty-four, fifty-two and forty inches in width and double. In addition there will be from one to two thousand feet of ten-inch double-dynamo belting. The immensity of this order will be better understood when it is stated that it will consume the hides of five hundred steers. Munson & Co. have a wide and enviable reputation for superior and special belting, and they are, probably, the most extensive manufacturers in the United States who make a point of always dealing direct with the consumer. By this method they are enabled to study the special wants of each customer, and to give perfect satisfaction.

Defiance, O., which started in with fifty Western Electric arc lights, has lately increased the number to an even one hundred. Defiance is highly pleased with the light. The Western Electric plant at Zanesville, O., was started this week, and the company has just sent out an arc-light plant to Wellington, New Zealand, and another to Honolulu, Hawaiian Islands. Business with the Western Electric Company is equally good in other departments, and the following hotels have lately been fitted up with the company's call-bell, fire-alarm and ring-back system: Montezuma Hotel, Las Vegas, N. M.; Grand Hotel, Vincennes, Ind.; Lansing House, Newark, O.; Capt. Evans' new hotel, Hot Springs, D. T.; Simmons' new hotel, Dakota Territory; Deming House (addition), Chicago, and another order for a hundred-room hotel in the Northwest has just been received. The Howeden Hotel, Chicago, has an arc-light plant of the Western Electric pattern, lately put in.

My Indianapolis advices say that the State House Commissioners are now receiving bids for electric lighting for that building. So far bids have been received from the Edison, Brush and United States Company, of Chicago.

At a meeting of the City Council at Evansville this week, an ordinance was passed notifying the Cumberland Telephone Co. to remove its poles and wires inside of 30 days. If not done within that time the chief of police will be instructed to do the work at the expense of the telephone company.

The Central Union Telephone Company is considering an arrangement for continuing business in Indianapolis by making each subscriber a sort of agent of the company and charging his office five cents for each connection made at his request. By this means every person using the telephone will be compelled to pay for its use. The agents are to be allowed commissions as follows:

The first 50 connections in a calendar month—No per cent. commission.

The next 100 connections in a calendar month 50 per cent. commission.

The next 300 connections in a calendar month 75 per cent. commission.

The next 500 connections (and over) in a calendar month 80 per cent. commission.

No commission is allowed on receipts for business going over the extra-territorial lines. Connections are charged to the office from which the call is sent. No charge is made against the office called up. The Central Union company reserves the right to terminate the agency at any time should it fail to be remunerative or unsatisfactory, but otherwise the agreement is to be in force and effect for the term of six months from the date of signature, and thereafter until the party of either part shall have given the party of the other part thirty days' written notice of his or its desire to discontinue the same.

This plan is now in operation at Richmond, Ind., and a large number of the Terre Haute subscribers are favorable to it.

In case the council does not interfere with the company's franchise in Indianapolis it is probable the same plan will be adopted there.

The Bay Mills, Sault Ste. Marie and St. Ignace telegraph line is finished.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes the following telephone stock quotations:

Bell of Mo.	$147@$150
Chicago	350@ 360
Central Union	43@ 45
Colorado	18@ 20
Cumberland	65@ 70
Great Southern	25@ 27
Great Southern Scrip, 90 cents on the dollar.	
Iowa Union	15@ 18
Michigan	63@ 66
Mo. & Kan.	54@ 56
Mo. & Kan. Scrip, 53 cents on the dollar.	
Rocky Mountain Bell	40@ 45
United	15@ 17
Wisconsin	104@ 106

W. A. K.

CINCINNATI, O., June 5, 1886.

I am sure you will take pleasure in announcing to your readers that the firm of C. E. Jones & Bro., whose establishment here suffered considerable loss from fire last December, this being the second time they were burned out, are once more in operation and ready for business.

At the time of the fire, they were considering the desirability of moving into more commodious quarters, and when the fire did occur, it made a move almost a necessity. To meet the emergency of the situation and the demands of their increasing business, they secured and remodeled the double brick building they are now in.

This firm was established some ten or twelve years ago, and by diligence, industry and close application to business has grown in that time from the occupancy of a single room (known as 58 Pike's Opera House) to their present handsome and commodious quarters in the four-story double brick. Their removal to this new location at 55 and 57 Longworth Street is the fourth time they have moved to accommodate the demands of their trade, and the necessary increase of their facilities. The firm manufacture and deal in a full line of telegraph and electrical supplies and in addition make a specialty of making models and doing experimental work, and their circular (which I have before me) in regard to work of the latter

character is the most complete of the kind I have ever seen. Their catalogue or circular will be sent to any address on application. All the harm any one wishes them is exemption from any more fires and a share of trade they so well deserve.

THE TELEGRAPH.

A New Company.—The Denver Eastern Railway and Telegraph Company, of Denver, Col., has been incorporated by W. H. Chamberlin and others with a capital stock of $100,000.

Tickers Under Injunction.—The litigation growing out of the action of the Commercial Telegram Company in removing their instruments from the Consolidated Stock and Petroleum Exchange has culminated in a decision by Judge Cullen to the effect that the company had violated the injunction and was guilty of contempt of court.

Railway Superintendents.—We are requested to announce that the fourth annual meeting of the Association of Railway Telegraph Superintendents will be held at the Hotel Ryan, St. Paul, Minn., at 10 A. M., June 16, 1886. The Executive Committee are C. W. Hammond, President; G. L. Lang, Vice-President, and P. W. Dreed, Secretary.

Malicious Damage.—A man giving the name of Samuel Johnson has been arraigned before a justice charged with having destroyed the batteries and wires connected with the danger signals on the Long Island Railroad, near Springfield, on May 30. Johnson was arrested after a desperate fight. He admits that he has a grudge against the Long Island Railroad Company. He has been held for trial.

The Franklin Telegraph Company.—At the annual meeting of the Franklin Telegraph Company, held in Boston on June 2, the following officers were elected: Directors, Charles A. Tinker. Thomas T. Eckert, Jay Gould, A. R. Brewer, Frederick L. Ames, Thomas Roche, Norvin Green, John Van Horne. J. F. Greenough; Secretary and Treasurer, R. H. Rochester; Clerk, Thomas Roche.

Spanish Telegraph Statistics.—The official telegraph statistics of Spain for the first half of 1885 have just been published. They show that in that period 15 new telegraph stations were opened to the public, of which seven belong to the State and eight to the railway companies, only one station having been closed. The increase of wire in the six months was 108 kilometres, bringing up the total on June 30 last to 17,596 kilometres of line, 129 of subterranean cable, and 236 of submarine cable. The number of stations belonging to the State was 534, those of the railway companies open to the public 330, semaphoric six, municipal 16 and private one. The messages transmitted numbered 1,608,091, of which 1,245,326 were internal telegrams and 362,765 foreign. The internal telegrams comprised 164,883 official messages, 982,291 private, 38,188 private messages of the railway companies and 59,876 service telegrams. The State revenue from telegrams during the six months was $500,000.

The Chinese and the Telegraph.—I remember the first introduction of the telegraph to China many years ago. For a long time every means, from moral suasion to bribery and corruption, was used at Peking to obtain permission to bring the telegraph to Shanghai. No power could possibly induce the Chinese authorities to consent. The Great Northern Telegraph Company had a cable to Hong Kong. They did not say anything. They quietly laid a cable to the mouth of the Wungpoo River, f urteen miles below Shanghai. They fixed up telegraph poles from an office there down the river side some distance, and one night they laid the cable up the river, connected it with their wires, and the day after they announced that the Chinese could visit their building and see it work. The Chinese came in crowds. They were asked to send messages to Hong Kong to their friends and they received answers, all free, and inside of four hours the company discovered that the Chinese were getting quotations from Hong Kong and speculating on the markets. The company shut up the free show suddenly and made piles of money, and the government never interfered with the telegraph.—*San Francisco Chronicle.*

THE TELEPHONE.

Mexico.—A dispatch of June 1, from the City of Mexico, says: "The Mexican Telephone Company has patented the Bell speaking telephone and the Blake transmitter for ten years in this country." This news is rather stale.

Works the Telephone with his Foot.—The Atlanta *Constitution* contributes the following story: As is well known, Col. William T. Newman carries an empty sleeve. It is true also that it is the right-arm sleeve that is unoccupied. The Colonel has a telephone in his office, and was at first puzzled to know how he could pull down the lever, which is on the right-hand side of the telephone. The trouble was overcome by an ingenious contrivance. A string was tied to the lever and a stirrup was allowed to dangle just above the floor. The Colonel now pulls down the lever with his foot.

A New Scandal.—Some little time ago it was rumored that efforts had been made to get early information, for stock-jobbing purposes, of Secretary Lamar's decision on the question of ordering suit against Prof. Bell's patents. Circumstantial revelations are now made in regard to a pool formed for bearing Bell stocks on the strength of the "tip," and it is said that the scheme failed because "the Boston people, who held the bulk of the stock, immediately made arrangements to tighten their hold on it." It is now al leged that there was a leak in the Interior Department, and that "the mistress of a prominent man in Washington" was in the case.

THE ELECTRIC LIGHT.

Defiance, O., has a new electric light company, formed by Mr. Elmer White and others, with a capital stock of $25,000.

Scranton, Pa.—The Scranton Illuminating. Heat and Power Company has a capital stock of $100,000. Mr. G. A. Jessup is the treasurer.

The Sewickley Valley Electric Light Company has been incorporated with a capital of $15,000. Its treasurer is Mr. R. D. McGonigle, of Pittsburgh.

Long Island.—The Long Island Electric Light Company, Limited, of East New York, has been incorporated by H. C. Buckhout and others. Capital, $100,000.

Tyrone, Pa.—The Home Electric Light and Steam Heating Company, of Tyrone, Pa., has been incorporated with a capital stock of $16,000. The treasurer is Mr. S. B. Templeton.

Yankton, Dak.—A stock company with a capital of $50,000 has been organized to put an Edison plant in Yankton. It is expected that the plant will be in operation by September, 1886.

Salem, Mass.—The Salem Electric Light Company will furnish the city with light for three years. The number of lamps to begin the new contract with is 75, displacing 85 oil and 285 gas lamps.

New Westinghouse Plants.—The Westinghouse incandescent lamps have been in use for some time at Butler, Pa., running off dynamos of local make. An order has now been given for Westinghouse machines. A plant of 200 lights has been ordered for the Norristown, Pa., operahouse, and another plant goes to the enterprising Burlington, Vt., *Free Press.*

Beaver Falls, Pa.—Application has been made for a charter for the Beaver Falls and the New Brighton Electric Light Company, for supplying New Brighton and Beaver Falls with light, heat and power by means of electricity. The incorporators are Julius F. Kurtz, H. W. Hartman, D. McKinney, Jr., J. F. Mines, and James B Oliver. The plant is expected to be in operation by the latter part of this summer.

Electric Lighting at Jacksonville, Fla.—A transfer has been made at Jacksonville, Fla., of the electric light plant of the American-Edison Company to the American Illuminating Company of that city. The new organization includes Messrs. S. B. Hubbard, J. Clark, W. H. Macduff, A. D. Stevens and H. H. Tibballs, Mr. Hubbard being the principal stockholder. By this change the local gas company assumes control of the electric lighting plant. Superintendent Stevens of the gas-works is now undergoing instruction from Mr. W. J. Jenks, in operating the Edison incandescent and American arc systems.

Wilkesbarre, Pa.—A dispatch from the above city of June 1 says: The Wilkesbarre Electric Light Company has had a monopoly of the light business in this city for three years past. All efforts to establish an opposition company failed until quite recently, when the Excelsior Electric Company, of New York, signified its intention of establishing a plant. The old company then cut down its prices, and this morning the attorneys for the company filed a bill in equity in Common Pleas Court to restrain the new company from erecting poles and stretching wires, the defendants claiming to have the exclusive right to this privilege.

Hartford, Conn.—A dispatch of June 5 from Hartford, says: The electric light company has proposed to light the whole city of Hartford for the appropriation of $42,000 made by the Common Council for the fiscal year, and, with a view of entertaining the proposition, the Street Board has had a complete map made of all the streets and present location of electric and gas lights. The gas company is yet to be heard from; but all things being equal, citizens will prefer the electric system exclusively. In case the proposal is not accepted, the electric company agrees to reduce its price from last year and to have the reduction date back to April 1. President Sprague, of the Street Board, said this afternoon that the matter would be determined as soon as the officers of the electric company had examined the street map referred to and determined where they could place lights.

APPLICATIONS OF POWER.

Detroit, Mich.—The Detroit Electric Railway Company has been incorporated by Henry M. Campbell and others. with a capital stock of $25,000.

PERSONALS.

Mr. J. H. Bunnell returned from Europe this week.

James Gordon Bennett and John Mackay figure in a London paper at hand as "Messrs. Gordon Benet and MacKay"—and such is fame.

Mr. W. B. Vansize, the patent expert, has resigned his position with the American Bell Telephone Company, to enter the service of the Electrical Accumulator Company, of this city. Mr. Vansize, who will be generally remembered as the former associate of Mr. C. L. Buckingham in the patent department of the Western Union Company, will occupy in his new business relationships a position similar to the one that gentleman holds with the Western Union.

MISCELLANEOUS NOTES.

The Advance Electric Company, of Chicago, has been organized by W. J. Fraser and others.

Graduation Theses.—At the recent graduation exercises of the Massachusetts Institute of Technology, Boston, theses were read by Mr. W. L. Church on "An Experimental Study of a Weston Dynamo," and by Theodore Stebbins on "Researches in Relation to Cable Telephony."

Electric Gas Lighting.—In the description of Messrs. S. W. Fuller & Holtzer's electric gas-lighting burners in our last issue, mention should have been made of the fact that the burners are manufactured under the patents of Mr. A. L. Bogart, the firm being his special agents for the sale of gas-lighting goods

Electric Lighting from Chloride of Silver Cells.—At the recent *soirée* of the Royal Society, among other electrical apparatus, Messrs. de la Rue and Hugo Müller showed how the chloride of silver battery could be applied to electric lighting by a quantity arrangement. Instead of using a solution of chloride of ammonium simply, the solution, containing 2½ per cent. salt, is converted into a vegetable jelly by dissolving in it Ceylon moss (Agar-Agar) to make a stiff jelly; this supports the zinc. The chloride of silver in powder is spread evenly on the bottom of the dish, on which a piece of silver foil is placed.

An Electrical "Stop."—A German *savant* who had long been suffering from the everlasting piano-forte playing next door has devised the following method of putting a stop to it at pleasure: An electric battery was connected with a powerful electro-magnet. Whenever a current of electricity was turned on, its effect could easily be felt through the wall by the horizontal steel strings in the piano, which was instantly put out of tune. Whenever the electric current was stopped, which occurred as often as the victim of the piano plague went out, the mystical influence stopped, and Miss Else, the offending pianist could play.

Triple Thermic Motor Officers.—There have recently been some changes in the officers of the Triple Thermic Motor Company, of Lowell. Mr. E. E. Wise, of Chicago, has resigned the treasurership, but retains his interest in the company, Dr. A. H. Burlingham, of Mount Vernon, N. Y., has resigned the presidency, and Horace R. Barker, of Lowell, has resigned as one of the trustees. The new officers are: President, Matthias Plum, of Newark, N. J.; Treasurer and Manager, H. B. Baird, of Minneapolis; and Mr. Wiggin, of Saratoga, and Railroad Commissioner Pierson, of New York City, are elected on the board of trustees.

The American Institute of Electrical Engineers held the first of its monthly meetings at the D'Orville Restaurant, Mills Building, Broad street, on the 8 inst. The meeting, preceded by a dinner, was devoted to the discussion of incandescent lighting from central stations. Among those present was Capt. Rapieff, of the Russian Navy, the inventor of the historic lamp bearing his name. A most enjoyable evening was spent, and it is believed that the attendance, good as it was, will be even larger at the next meeting of the kind after the summer recess. It is proposed to hold one informal meeting during the summer at Mr. Erastus Wiman's new pleasure resort on Staten Island and to examine the electrical apparatus now being installed there.

Electricity in the Kitchen.—Miss Harriet Lawrie, otherwise known as the "Electric Star," describes how she was able to light her kitchen fire from her bed room through the medium of electricity. Having made the necessary connections between the fireplace and her room, she says: "In my bed room I placed a four-cell bichromate battery, with a lever attachment, to raise the elements from their cells. In order to light my fire I had only to raise the lever (which was placed within my reach), thus lowering the elements and completing the circuit. The platinum wire in the kitchen then became incandescent, setting fire to the lighting paper, which in turn set fire to the tissue, and this to the patent wood, etc., and it was a complete success."

The Boulton Standard Carbon Company, of Cleveland, O., recently organized, with Mr. W. H. Boulton as general manager, has issued a price-list, quoting Boulton Standard carbons, Austrian carbons, and "common." The company is now fitting up machinery to make cored carbons, and it says "We have reduced the carbon business to a science, and with our improved machinery and the use of a certain chemical which increases their durability. carbons of the same material twelve inches long can be made to burn 6, 8, 10, 12 or 14 hours as may be desired. At the same time, this chemical purifies the material and consequently improves the quantity and quality of the light."

Electric Gas-Lighting Litigation.—In the case of the suits brought by the Electric Gas Lighting Company of Boston against Mr. A. L Bogart of this city, affecting the control of what are known generally to the electrical trade as "hand-lighting burners," Judge Wallace granted a decree on the 29th of May in which he declares the patent No. 232,304 granted to Sandford to be invalid on account of the priority of the patent granted to H. F. Packard, numbered 225,267, owned by Mr A. L. Bogart; also that the apparatus manufac ured by Mr. Bogart does not infringe either of the other patents included in the bill of complaint of the Electric Gas Lighting Company, viz., that of Wm. A. Pitt. No. 139,811, or that of J. P. Tirrell, No. 232,-661. The decision is understood to leave the matter practically as it stood before the suits began.

SPARKS AND FLASHES.

The Number of The Hymn.—While Charles A. Dana was managing editor of the New York *Tribune*, Joe Howard was officiating as war correspondent. A great battle had been fought, and Joe was telegraphing a description of it. He began with an exordium: "To God be all the glory! Mine eyes have seen the work of the Lord, and the cause of the righteous has triumphed," with more of the same sort, followed by the words: "The army of the Potomac is triumphant. We have won a great victory." A day or two afterward he received a letter from Mr. Dana, something like the following. "Hereafter, in sending your reports, please specify the number of the hymn, and save telegraph expenses."

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2¼, a 3; Western Union, b 60¾, a 60¾.

Telephone.—Am. Bell, b 180, a 181; Erie, b 27¼, a 27¾; New England, b 34½, a 34¾; Mexican, b 1¼.

Electric Light.—No new quotations.

BUSINESS NOTICES.

Kidder Apparatus.—The following speaks for itself:

HENDERSON, Tex., May 22, 1886.

Jerome Kidder Mfg. Co., No. 820 Broadway, N. Y.:

GENTLEMEN: Herewith please find money order. Kindly send me the following: * * *

Your Electro-Medical Apparatus is growing more popular here, and will be much used in the near future. If I could not get another apparatus, $500 would not buy the one I have. My faith in the practice of electricity for nearly all diseases is very strong.

Very truly yours, T. JAMES.

Hale's Honey,

The great cough, throat and lung cure, 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals—beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS, will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

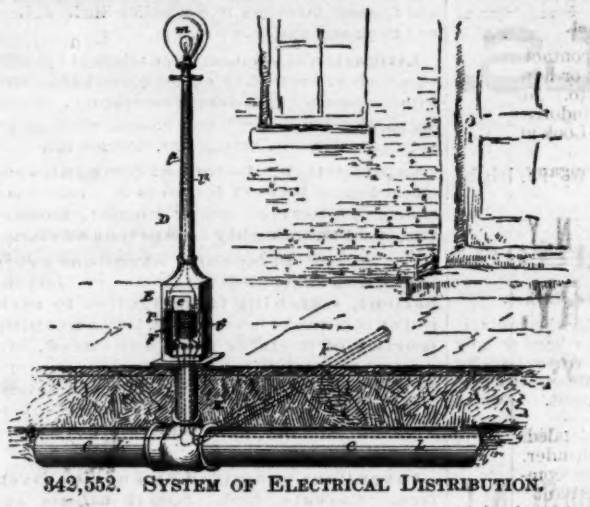
PATENTS DATED MAY 25, 1886.

342,320. Insulator; Edwin C. Blake and Ernest C. Trimwell, Worcester, Assignors to themselves and George P. Hunt, Boston, Mass. Consists of improvements upon patent 154,451, of Aug. 25, 1874.

342,324. Insulator; Alexander Brandon, New York, N. Y. Consists of a bar of insulating material formed with a longitudinal tongue formed or fitted on one side or face thereof, and a counterpart longitudinal recess on its opposite face, whereby any two or more of the bars may be fitted together so as to interlock; the longitudinal tongue being notched transversely at equal intervals to receive the wires.

342,340. Signaling Apparatus; Walter J. Dudley, Everett, Mass. Consists of details of construction. It relates to an individual call signal system.

342,385. Secondary Battery; William H. Remington, Boston, Mass.. Assignor to Edward F. Hagar, same place, and Henry Sawyer, Chelsea, same state. Consists in preparing a saturated solution of lead in caustic alkali, immersing the lead plate therein, and depositing a coating upon said plate by electrolytic action.



342,552. SYSTEM OF ELECTRICAL DISTRIBUTION.

342,407. Galvanic Battery; Hugo Walter, Cincinnati, O., Assignor to the Walter Electric Co., same place. Consists of faucets near the bottom of the cells in combination with details of construction.

342,421. Extraction of Precious Metals; David W. Birmingham, Clifton, N. Y. Relates to an electrical settler for collecting floured mercury, and consists of a vat, provided with a metallic bottom, and an agitator constructed with alternate agitators of conducting and non-conducting material.

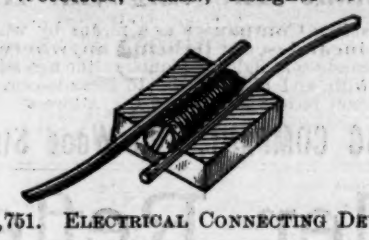
342,441. Holder for Commutator Brushes; Charles D. Jenney, Indianapolis, Ind. Consists of a hub surrounding the commutator-shaft, provided with a circumferential groove, a brush-holder rocker-arm mounted upon said hub, and provided with projections which enter said groove, one of the projections having a handle by which it can be adjusted and a rocker-arm thus held in adjusted position

342,475. Indicator; Frederic A. Swan, Everett, Mass. Consists of a case, dial, pointer and mechanism to move the pointer, combined with a solenoid having its core connected to said mechanism, the movement of said core within said solenoid being transmitted to said pointer through said mechanism, to indicate current changes in the circuit in which the indicator is placed.

342,477. Telephones; Norman A. Tanner, New Haven, Conn. An auxilia y mouth-piece *A* is provided as shown in the cut.

342,481. Chronograph; James A. Tilden, Hyde Park, Mass. Its object is to make the clock of a thermostat system automatically test the condition of the circuits at any desired intervals. The clock is provided with an automatic marker or indicator.

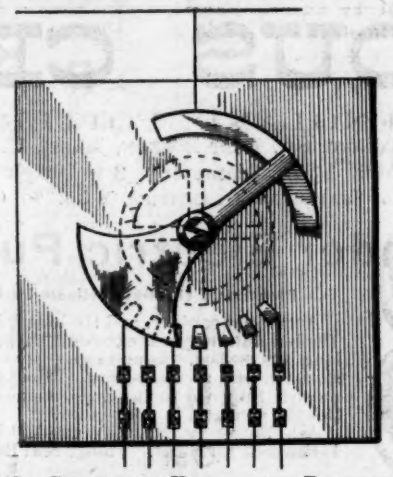
342,495. Apparatus for Flushing Siphons; Albert A. Barker, Worcester, Mass., Assignor of one-half to



342,751. ELECTRICAL CONNECTING DEVICE.

Nathaniel C. Tricker, same place. He employs a magnetic device which operates a valve when the water arrives at a certain level.

342,499. Railway Signaling; William C. Crandell, Jr., Philadelphia, Pa., Assignor of one-half to Samuel



342,748. SYSTEM OF ELECTRICAL DISTRIBUTION.

Strohm, same place. Consists of railway station appurtenances having partial electric circuits with contact-plates, step-by-step mechanism for making and closing

342,477. AUXILIARY MOUTH PIECE FOR TELEPHONES.

a break in one of said partial circuits, and an engine or train provided with complementary partial circuits and brushes.

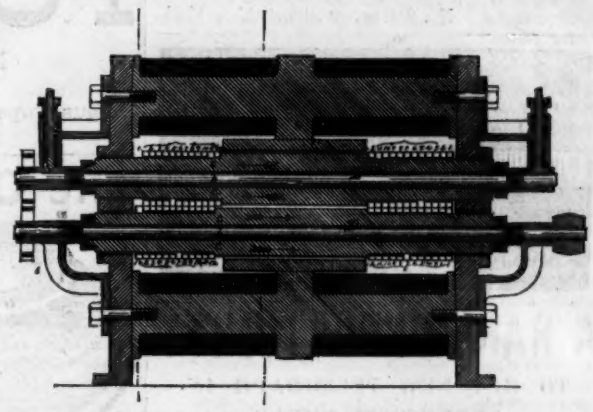
342,504, 342,587, 342,588, 342,589. Dynamo; Rudolph Eickemeyer, Yonkers, N. Y. The general nature of the dynamo covered by the patents is shown in the cut. The leading claim is for the application of parallel strips connected in series and forming the core or field magnets or pole pieces.

342,508. Galvanic Battery. Ernest M. Gardner, Brookline, Mass. The containing vessel is made wholly of carbon and constitutes one electrode.

342,523. Cable; Hosea W. Libbey, Boston, Mass. It is composed of alternate layers of copper and non-conducting material, and finally a layer of zinc.

342,549. Electric Lighting System; John H. R. Ward, Stoughton, Mass., and William J. Jenks, New York, N. Y., Assignors to the New England Wiring Co., Boston, Mass. The object is to light the same room by switches at distant points. Consists of an electro-magnet controlling the electric light circuit and having two sets of coils, and switches controlling the circuit of each of the sets.

342,552. Electrical Distribution; 342,553. Induction Coil; George Westinghouse, Jr., Pittsburgh, Pa. The first relates to an application of the induction coil to the illumination of streets and houses, as shown in the cut, and one of the devices for carrying out the second invention consists of a series of thin plates having outwardly-projecting arms, plates connecting the ends of



342,587. DYNAMO-ELECTRIC MACHINE.

the arms, and conductors within the spaces between the arms.

342,576. Relay; Sidney A. Chase, Evart, Mich., Assignor of one-half to William R. Mapes, same place. Consists of two contact-screws, one of which is in direct contact with the metallic yoke, while the other passes through an insulated aperture in the yoke.

342,594. Storage Battery; Charles D. P. Gibson, New York, N. Y., Assignor to the Gibson Electric Co., of same place. Powdered lead is inclosed within the plates provided with pockets. Burrs are forced down upon the lead powder.

342,666. Electro-Magnetic Transmitter; John T. Williams, Mount Vernon, N. Y. Relates to telpherage. Consists of a series of solenoids and a carriage of iron passing through them and provided with automatic circuit controllers.

332,748. Electrical Distribution; John W. Howell, New Brunswick, N. J. Consists of a feeding conductor composed of two or more strands or wires insulated from one another, in combination with means (shown in the cut) for placing a greater or less number of such strands in circuit.

342,751. Electrical Connecting Device; Edward H. Johnson, New York, N. Y., Assignor to Bergmann & Co., same place. The device is shown completely in the cut.

George H. Pride, Electrician, Telegraph Engineer and Contractor. 9 Dey Street, New York.

Short-hand Lesson Sheets, For Self Instruction. $1. A complete Reporter in 12 Easy Lessons. Close & Black, Pub. 1338 Chestnut St., Phila., Pa.

STANDARD Electrical Test Instruments.

Galvanometers, Resistance Coils, Condensers, Keys, Switches, &c., Bailey Combination Set, Pratt's Speed Indicator, &c.

Electric Mfg. Co., Troy, N. Y.

OFFICE, 311 RIVER STREET.

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Care THE ELECTRICAL WORLD, New York.

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A simple system of Fac-simile Telegraphing, one which can be demonstrated to be eminently practical, seeks capital to properly develop and operate the same. A provisional arrangement will be made, satisfying critical investigation before investment. Correspondence solicited. Address FAC-SIMILE, Western office THE ELECTRICAL WORLD, 44 Lakeside Building, Chicago.

SEBASTIAN, MAY & CO.'S IMPROVED $60 Screw Cutting Lathe.

Designed especially for electricians and others requiring a lathe for accurate work. Catalogue of Lathes, Drill Presses, Tools, etc., mailed on application.

LATHES ON TRIAL.

163 W. Second St., Cincinnati, O.

WANTED.

To purchase new and *good serviceable* second-hand Dynamos and general electrical apparatus and stores; also gas and other engines.

Send particulars of what you want to sell or exchange.

THE AMERICAN ELECTRICAL SUPPLY AGENCY,
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WANTED.

An Electrical Engineer, age 26, who has a thorough practical and theoretical knowledge of electric lighting, etc., desires engagement. First-class references.

Address A. R. ROE,
25 Lowther avenue,
Toronto, Canada.

FOR SALE.

Will be sold cheap—

One 100-light Incandescent Dynamo, perfect self-regulating, giving an economy of 10 16-candle lamps per I. H. P.

One 20-light Dynamo.

One 4 Arc Light Dynamo.

One 2 Arc Light Dynamo (can run Incandescent Lamps).

Address H. W.,
Care THE ELECTRICAL WORLD,
No. 9 Murray St., New York

William Marshall, Mfr. of Elec. Condensers. Standards a Specialty. Rooms 2 and 4 University Building, cor. Waverley and University Places, N. Y.

SPECIAL NOTICE.

National Electric Light Association.

SEMI-ANNUAL MEETING.

The Fourth Meeting—Semi-Annual—of the National Electric Light Association will be held at Detroit, Mich., on Tuesday, Aug. 31 next, at 10 o'clock A. M.

Dues being payable in advance, all members are required to forward the same for the year 1886, by check or otherwise, payable to the order of J. F. Morrison, President, Baltimore, Md.

Electric Light Companies and Manufacturers of Electric Light Apparatus, supplies, etc, desiring to become members must apply on or before Aug. 31 to the President, J. F. Morrison, Baltimore, Md.

Members and others desiring information as to railroad transportation rates will address J. F. Noonan, Esq., Chairman Committee on Transportation, Paterson, N. J.

Special hotel rates will be made known previous to meeting of the Association.

A. J. DE CAMP,
Chairman Executive Committee,
Philadelphia.

J. N. RAYMOND,

MANUFACTURER OF

LEAD AND COMPOSITION PIPE

For Electric Light, Telephone and Telegraph Cables.

Circulars Furnished upon Application. Correspondence Solicited.

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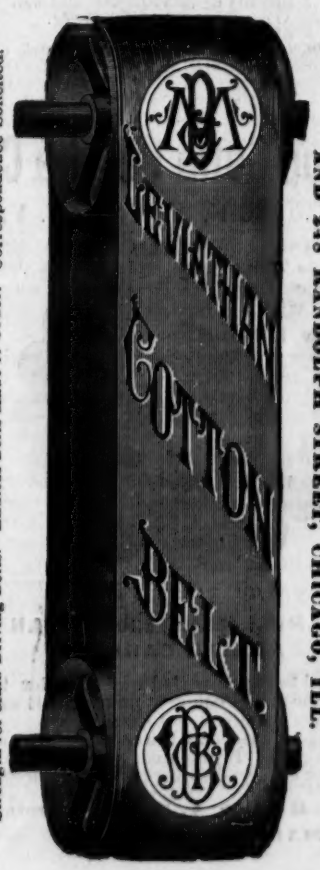
LEVIATHAN COTTON BELTING.

Unsurpassed for Strength, Durability and Cheapness. Made to any Length, Width and Strength for Main Driving Belts. Endless Belts Made to Order. Correspondence Solicited.



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CONDUCTIVITY AND ABSORPTION
OF E.M.F OF COPPER WIRE.
Invaluable to all electricians and persons engaged in electric lighting. The only table published. Sent on receipt of 25c. C. E. JONES & BRO., Cincinnati, O.

Domestic Electricity for Amateurs.

Translated from the French of E. Hospitalier by C. J. Wharton, Associate of the Society of Telegraph Engineers and Electricians.
Cloth, 229 Pages. 155 Illustrations.

Price, postage prepaid, $3.00.

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TO BUY NEW TELEGRAPH INSTRUMENTS CHEAP.

In order to dispose of my remaining stock of Telegraph Instruments rapidly, I will sell New Keys, Sounders, Relays, W. W. Pin Switches, etc., at 50 per cent. less than usual prices, in lots of one or a dozen. Extra discount on entire stock. These instruments are in good order and made by myself. Address

R. K. PEARCE,
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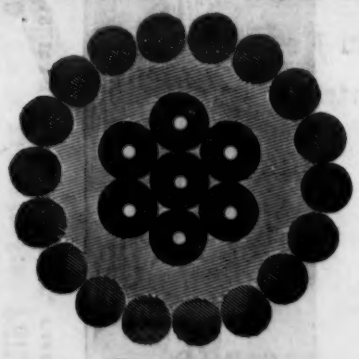
MANUFACTURERS OF
Superior and Special
BELTING,
240-242 Randolph St., Chicago.

CHICAGO, March, 1886.
We gladly testify as to the superiority of the **Munson Dynamo Electric Light Belt.** The stretch, otherwise than the elasticity, is removed; no rivets and perfect evenness in heft. The result, a perfect motion, which is absolutely essential for a steady light. We use no other make. The character and responsibility of the house is unquestioned.
WESTERN EDISON LIGHT CO.,
Per H. WARD LEONARD, Gen'l Supt.
W. J. BUCKLEY, Manager Chicago Office,
Fort Wayne Jenny Electric Light Co.
SPERRY ELECTRIC LIGHT CO.,
Office, 401 Royal Insurance Building, Chicago.
THOMSON-HOUSTON ELECTRIC CO.
GEO. L. CROSSMAN, Manager Western Office.
THE BRUSH ELECTRIC CO., Chicago Office,
By ALEX. KEMPT, Special Agent.
C. J. REILLY,
Western Manager Excelsior Electric Co.
FOREST CITY ELECTRIC LIGHT CO.,
Rockford, Ill.

THE
Bishop Gutta Percha Co.,
420 to 426 E. 25th St., N. Y.,



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to be equal to any imported and superior to all others made in this country, and will sell as low as first-class goods can be furnished.
All kinds of Insulated Wires at lowest prices, Acid Vessels of all kinds, and Pure Gutta Percha for all purposes at reasonable prices.

HENRY A. REED, Secretary,
W. W. MARKS, Supt.

Incandescent Lighting on Arc Light Circuits.

THE BROWN AUTOMATIC CONVERTER

Will supply and take care of ten to twelve 16 c. p. Incandescent Lamps at any point on an Arc Light circuit from an initial current of 9.5 ampères, equal to 2,000 c. p. Arc Lamp.

CAN BE USED WITH ANY MAKE OF ARC LIGHT DYNAMO.
Any Number of the Lamps Can be Turned On or Off Without Affecting the Rest.

Invaluable to **Arc Lighting Companies** as a means by which they **can secure customers, from one up, for incandescent lighting anywhere on their circuit** without involving large expense for incandescent lighting plants, or the necessity of getting a large number of subscribers to commence with, and also valuable to incandescent lighting companies for customers too distant for the ordinary incandescent circuits. Address

THE BROWN ELECTRIC COMPANY, 400 Wood Street, Pittsburgh, Pa.

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Special Shapes for Particular Uses. Arc and Incandescent.
WHEELER REFLECTOR CO.,
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Porous Cups in sizes from 1¼ in. diameter × 3 in. high to 7 in. × 9½ in. high.
SPECIAL SHAPES IN QUANTITIES MADE TO ORDER.

The Ostrander Electric Push Button.

Pronounced the Only Reliable Push Button on the Market.

A rubbing contact, and the longer in use the better the contact. The button always sure to come back, no matter how hard or how long it is pushed. Long brass screws to fasten the wires to. No iron pins or screws to rust. New designs. Architects' indorsements. Superior to any and as cheap as the poorest. Look at this list and send in your order.
Ash, Butternut, Black Walnut, Cherry, Cocobolo, Mahogany, Rosewood, Ebonized. Flange real Bronze, high polish.

W. R. OSTRANDER & CO., 21 and 23 Ann St., N. Y.

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The Original Carbon Cylinder Battery.
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Among the many open-circuit batteries the "Little Giant" is unequaled. Most economical on account of the indestructibility of the carbon cylinder. After long usage a new zinc and fresh solution of sal-ammoniac will completely restore its activity and usefulness. By actual tests the "Little Giant" has discounted all others for its particular adaptation to the various uses of the
Telephone, Long-Distance Telephone, Electric Bell Work, Electric Gas Lighting, etc.
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FIRE AND BURGLAR-PROOF SAFES.

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EFFICIENT, DURABLE, EASY TO OPERATE, LESS DANGEROUS.
THE MOST ECONOMICAL POWER IN THE WORLD
Saves One-Half the Fuel and Defies all Competition.

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W. J. JOHNSTON, Prop. | E. P. THOMPSON, M.E., E.E., M'g'r.

This Agency continues to apply for patents on inventions, and in all countries where patents are obtainable, and to pay especial attention to **complicated and difficult cases,** and to those that other patent solicitors have been **unsuccessful** with. **Its facilities** have lately been **much increased and improved,** and its clients can rest assured that, as heretofore, their interests will always be **faithfully** and **conscientiously studied and zealously watched over by competent experts,** and that the work on their applications will be performed in a **prompt, thorough** and **painstaking** manner, **at very reasonable rates.**

Inventors are cordially invited to correspond with us, or to call and see us. We make no charge for advice by mail or for consultation regarding any case in which our professional services may be required, and are always glad to furnish information and to assist inventors in perfecting their devices and attaining satisfactory results.

Litigation of any description relating to patents vigorously prosecuted by expert counsel associated with the Agency. **Expert Testimony,** including physical and chemical experiments, where necessary. Assignments, agreements, licenses, etc.

Capitalists, projectors of companies and others desiring **Expert Reports** on inventions or systems, can rely upon getting **honest, impartial, and thoroughly competent advice.**

The Manager **personally examines every invention** committed to the Agency, devoting **patient, searching investigation to each point** of merit and improvement, letting **nothing worthy of a claim pass unnoticed.** His personal attention and direct supervision are subsequently given to **every detail,** insuring **scientific precision** in the preparation of the **specification** and **the best possible construction of claims.**

Inventions examined and advice given free. Caveats filed. **Specifications** and **Drawings** prepared. **Searches** and **Examinations** made as to **value,** novelty and patentability of Inventions; scope and validity of Patents, Infringements, Interferences, etc.

Electrical Cases are our Specialty.

THE ELECTRICAL WORLD is devoted wholly to electrical matters. We have a standing order at Washington for copies of the specifications and drawings of all electrical patents as they are issued, and our library contains every work relating directly or indirectly to electricity. For more than a decade our business has made us familiar with the progress and development in electrical matters. We know what has been done in any separate branch or in regard to any particular application of electricity, and we can readily tell what, if anything, has already been accomplished in the field to which belongs any case placed in our hands. It certainly stands to reason that with all this knowledge, and with the facilities at our disposal, we can prosecute applications for patents in electrical cases better, more thoroughly, and at less expense to the client, than can the ordinary patent solicitor lacking this special information, special training and special mastery of the subject in all its details. It also goes without saying that our clients have very little trouble in such cases. Understanding the subject thoroughly, we can readily see the points they make, and not infrequently suggest additional ones. We also prepare drawings so simple and intelligible that there is no friction in the Patent Office.

Our Clients Include

Some of the best-known electricians, chemists and mechanical engineers, both of the United States and of Europe. Several patent attorneys also turn over to us some of their **important cases,** especially their electrical ones. A well-known firm of patent agents in England began by sending us their **Electrical** cases, and are so well satisfied that they now send **us all their Electrical cases, and some of their Engineering ones.** When they sent the first cases—which they did without solicitation on our part—they said:

"We do a very considerable patent business with the United States, and shall be happy to send you those relating to electricity and its applications, as WE FEEL SURE THAT THEY COULD NOT BE IN BETTER HANDS."

That they have not been disappointed is shown by the following extract from one of their recent letters:

"We are EXTREMELY PLEASED with the VERY PROMPT AND SATISFACTORY manner in which you have put the —— and —— patents through."

The Client Should Visit this Office

in all cases where he can do so with little trouble or expense, as he will find it much more satisfactory to transact his business in person.

Where this is Inconvenient,

however, business may be carried on to completion by **correspondence.** In such cases it is only necessary to send a statement of the case, giving the subject of the invention, describing fully and plainly what you claim or think is new, enumerating the advantages resulting from your improvements, and stating to what use or uses your invention may be applied; inclosing at the same time one or more rough sketches. On receipt of this we will—**without charge**—forward our opinion of the invention and of its patentability, telling you what the expense of obtaining a patent would be, and giving you information how to proceed to secure a patent.

Correspondence solicited. All communications treated with **inviolable confidence.** Addr

JOHNSTON'S PATENT AGENCY,
No. 9 Murray St., New York.